The FOUNDRY

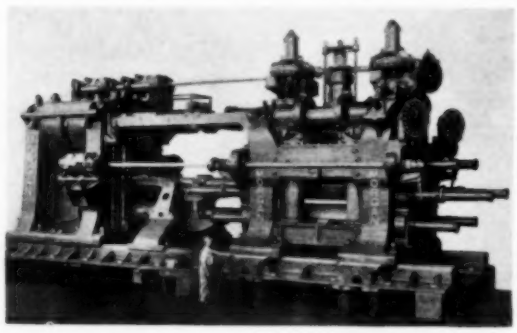
Volume 59
Number 12

Published
Semimonthly

CLEVELAND, OHIO, JUNE 15, 1931

Castings Form Wrought Iron into Plates

ADVANCE and progress in steel rolling mill practice has led to the development of variety of rolling devices which range from those used for producing extremely thin steel strips from which safety razor blades



Courtesy Morgan Engineering Co.
Two-high Mill Can Produce 84-inch Sheared Plates of Wrought Iron

are formed, to the huge universal plate mill shown in the accompanying illustration. Some conception of its size may be formed by comparing the height of the man in the foreground to the height of the mill. The mill has a height of 20 feet 9 inches, and a length of 53 feet 7¾ inches. It is driven by a 4000 horsepower motor. The vertical rolls shown control the width of the plate rolled and may be adjusted from a minimum of 12 inches to a maximum of 50 inches. Without the vertical rolls, an 84-inch sheared plate may be rolled. The horizontal rolls are 46 inches in diameter, and will be employed in rolling wrought iron. As in other steel mill equipment, castings play an important part. The rolls are cast products as are the housings which support the rolls. Castings also form the housing which encloses the driving mechanism at the right, and the bed on which the roll stand and driving mechanism are fastened.

Find Where Castings Can Be Sold

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THE FOUNDRY is published semimonthly by the Penton Publishing Co., Penton building, Cleveland, O. Member, Audit Bureau of Circulations, Associated Business Papers and National Publishers Association.

Branch Offices: Chicago, Peoples Gas building; New York, 220 Broadway; Pittsburgh, Oliver building; Cincinnati, Schmidt building; Washington, National Press building; San Francisco, Alto building; London, Caxton House, Westminster, S.W.1; Birmingham, England, 14 New street; Paris, 9 Rue de Londres; Berlin, Dahlmerstrasse 64A, Berlin Lichterfeld-West. Cable address, Irotrapen, London.

Subscription: United States and Mexico, $3.00 a year; Canada, $4 a year; Great Britain and other Foreign Countries, £1:0:0 a year; single copies 25 cents. Copies published three months or more previous to date of current issue, 50 cents each.

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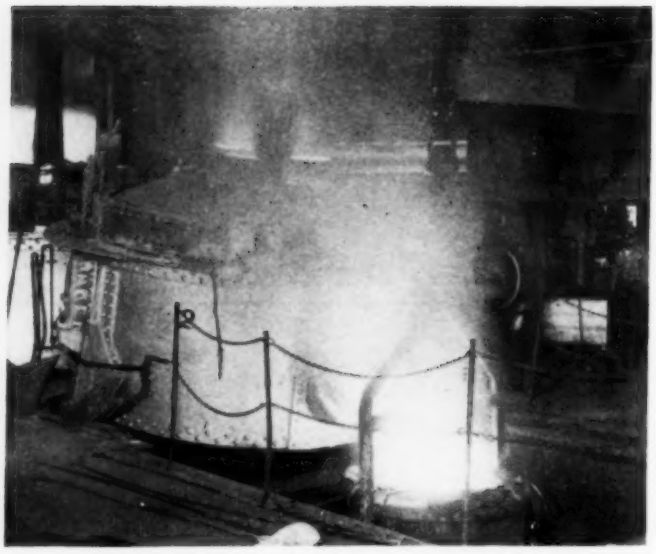

Fig. 1—Molten Steel Is Tapped into a Ladle in the Pit

Steel Foundry Based on Study

FLEXIBILITY of practice to match competition has helped Burnside Steel Foundry Co., Chicago, to serve buying groups ranging from the grain prairies and oil fields to power plants and locomotives. This is characteristic of the closer calculation and control which is guiding the steel jobbing foundry into production of sounder quality castings for broader uses.

The foundry management, recognizing that the variables and problems in steel jobbing foundry practice are legion has set up such precision in method that it may be adjusted easily to meet individual needs of castings customers. The foundry has developed its procedure from careful investigation of the melting and refining of its metals, molding and core sands, distribution and handling methods, both for raw materials and castings in process, effects of different elements in steel upon physical and metallurgical properties, shrinkage conditions, heat treatment, heading and gating, and numerous other problems. To this end, and to make operations even more economical, the company in the last four years has added additional equipment.

The range of products includes castings for such diversified industries as tractors, farm tillage and harvester machinery, excavating and road building machinery, conveying equipment, oil refineries, foundry equipment, locomotives, cranes, trucks and oil well supplies. In addition steel castings are supplied for rolling mills, railroad specialties and equipment, packing houses, machine tools, railway cars, coal mining machinery, pipe line castings, pressure fittings and miscellaneous repairs.

High temperatures and pressures impose exacting demands on castings for power plants and oil refineries and the foundry management has set up some new standards to meet the metallurgical conditions required. Pressures up to 600 pounds per square inch are being used generally in power plants and in some as high as 1400 pounds per square inch. Even higher temperatures and high pressures are being specified for oil refinery work. Increasing high pressure demands will work toward even greater requirements from the steel castings industry.

"Steel castings play a vital part and solve the problems successfully in those industries in which machines, appliances and equipment are designed and constructed for better and longer service," states an official of the company. "Steel foundries of today are called upon to produce cast steel parts which must be tough to withstand shocks, ductile to resist repeated stresses, strong to support the load and stand up under temperatures, light for minimum weight, clean for good appearance, and true to drawing and pattern in order that machining and assembly costs be held to the minimum.

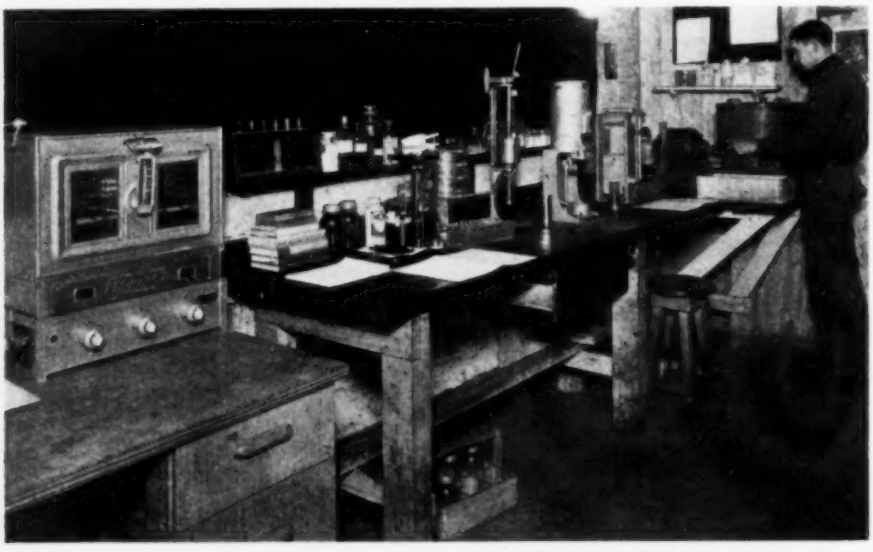

Fig. 2—Sand Control Tests Are Carried on in a Separate Laboratory

Practices of Variables

By F. B. Pletcher

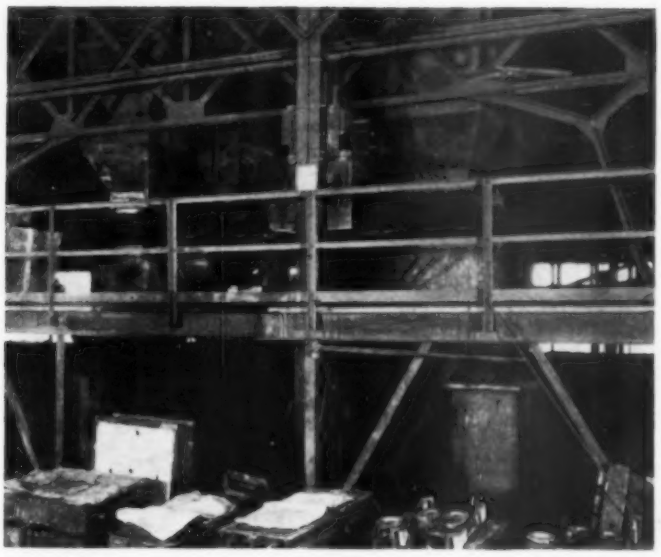

Fig. 4—Sand Mullers Are Placed Directly Below the Hoppers

In the face of such requirements, the modern steel foundries have made surprisingly rapid strides in the production of steel castings more suitable for the purpose intended.

"Best quality in a steel casting from a customer's standpoint means a high-grade steel of correct analysis, solidified properly to the shape and dimensions required, heat-treated to relieve casting strains and to refine the grain, machineable, absence of defects and proper cleaning. Proper scrap, sound charging and melting practice in a modern electric melting and refining system has helped solve our problems, as have studies of shrinkage conditions, sand handling, conditioning and distribution, sand testing laboratory, annealing and normalizing, core preparation and pattern storage."

Much emphasis also has been placed by the Burnside Steel Foundry Co. on castings design as differentiated from the mere design of parts and sections. Co-operative efforts in design with customers' engineers have solved numerous difficult castings problems. Often the suggestions to customers for changes in patterns to suit the foundry practice have resulted in all-around betterment of the work for the buyer of the castings. Changes sometimes are suggested to provide for proper feeding when it is deemed essential to avoid variables resulting from unequal sections.

Approximately 650 tons of castings are produced monthly, and the steel is produced in two acid-lined electric furnaces supplied by the Swindell-Dressler Corp., Pittsburgh, which are mounted on an electrically driven turntable, and served by a single set of electrodes as shown in Fig. 1. The furnace shells have a capacity of 4 tons each, and the turntable arrangement allows preheating the cold charge in one shell while the charge in the other is being melted down.

Castings range in weight from 1 pound to 3 tons, but the average weight is about 12 pounds which represents a reduction from the averages for other years. Green sand molding is employed largely, and is performed on jolt-squeeze ma-

Fig. 3—General View of the Foundry, Showing the Molding and Pouring Floors

Fig. 5—Combustion of Gas for the Oven Takes Place Outside in a Special Chamber

chines, on the bench and in snap flasks. A representative group of the class of castings produced by the Burnside Steel Foundry Co., is shown in Fig. 6, and includes high pressure refinery fittings, tractor castings, harvester combine castings, farm implements, gears, pinions and miscellaneous castings.

The firm makes a specialty of three grades of pearlitic, manganese alloy steel containing from 1.25 to 1.75 per cent manganese which are used both in the heat treated and normalized state, depending upon the requirements and service demanded from the castings. A group of sprockets and gears made of that type of alloy steel is shown in Fig. 7. Many designing engineers are recognizing the valuable physical properties of pearlitic manganese steel for parts which must stand repeated stresses, possess resistance to shock and impact and have good wearing qualities.

To carry out molding operations more economically, the Burnside Steel Foundry Co. has installed sand handling and conditioning equipment.

A difficult problem was encountered in arranging the system as it was desired to locate the distributing belt, and the molding machines along the steel columns which separated the main foundry bay from the east bay. This was worked out satisfactorily by elevating the sand to the top of the main north and south bay, above an extensive crane system. With that arrangement the molding and pouring floors could be kept clear, the conditioning equipment could be built next to the molding floor in the east bay, while the squeezer machiness on one side of the dividing columns, and the jolting molding stations on the other, remained intact as designed.

The sand handling and conditioning equipment was designed and installed by the National Engineering Co., Chicago, and consists primarily of equipment suitable for handling shake-out sand, conditioning the sand, and its distribution to molding stations by means of continuous belts.

The shake-out, just north of the pouring area, utilizes a series of steel grids embedded in the floor, on which the molds are shaken from the flasks. The castings are picked out and deposited in large crane buckets for transfer to the cleaning operations. The sand passes through the shakeout grids onto a reciprocating conveyor which transfers it under the main foundry bay to the conditioning equipment just off the main bay. Thence, the sand falls onto a continuous belt which starts it through the conditioning operations.

Sand passes over a magnetic pulley, supplied by the Dings Magnetic Separator Co., Milwaukee, which removes all nails, gaggers and other metallic particles. The sand then drops into an enclosed squirrel-cage type revolving riddle formed of ½-inch punched plate. The riddling action loosens all cores, sand lumps and extraneous material. A current of air from a blower passing through the riddle removes the fines from the sand, after which the latter again falls to a conveyor belt, whence it is passed to a bucket elevator.

Store Sand in Hopper

The elevator raises the sand load to a conveyor belt, which serves the two 80-ton hoppers for used sand. These are arranged so that they may be filled alternately, thus enabling the sand to cool properly before milling. Between the two used sand hoppers a new sand hopper with a capacity of 40 tons is located.

Directly below the hoppers are two sand mixers of the muller type as shown in Fig. 4. Measuring hoppers just above the mixers are arranged so that the proportion of old sand to new is controlled definitely. The proper proportions of bond and moisture are added to the sand in the mills. After milling, the molding sand is dumped automatically onto a conveyor belt for transfer to a bucket elevator, then carried high above the foundry floor to its place on the transfer conveyor belt, which clears the crane runways.

From the belt the sand falls through a chute onto the line convey-

Fig. 6—Oil Refinery Fittings, Tractor and Farm Implement Castings and Railway Specialties Are Made by the Firm.
Fig. 7—Sprockets and Gears Made from Pearlitic, Manganese Steel

or belt which serves all the molding machines. By means of scrapers, the sand is shunted into chutes leading directly into the molding machine hoppers. Each hopper has a hand release, which permits the sand in the volume desired to fall into the flask.

The foundry's study of molding sands has led to a complete sandtesting laboratory. Fig. 2 shows most of the testing equipment, which includes a laboratory size sand mulling machine supplied by the National Engineering Co.; compression tester, specimen rammer and moisture indicator, and a permeability machine, all supplied by Harry W. Dietert Co., Detroit; a laboratory drying oven, balances and other auxiliary equipment.

Test the Molding Sand

Before shipments of sand are permitted to be unloaded, sand tests are taken to determine if grain fineness and natural bond come up to the desired specifications. Each day sufficient tests are made on the molding sands to check the various requirements for the class of work in production. The sand samples are sealed in air-tight containers and taken to the sandtesting laboratory, where tests are conducted for moisture content, permeability, green and dry strength. Each test is recorded in graph form for comparative and anlytical purposes.

Daily reports from the cleaning room on the various classes of castings are a second check on the sand formulas in use, and any unusual condition in the finish of the castings can be checked and analyzed by the daily sand tests in the laboratory. The decidedly close sand control made possible by the company's sand handling and conditioning equipment is illustrated by the accompanying graph of 100 average consecutive tests shown in Fig. 10.

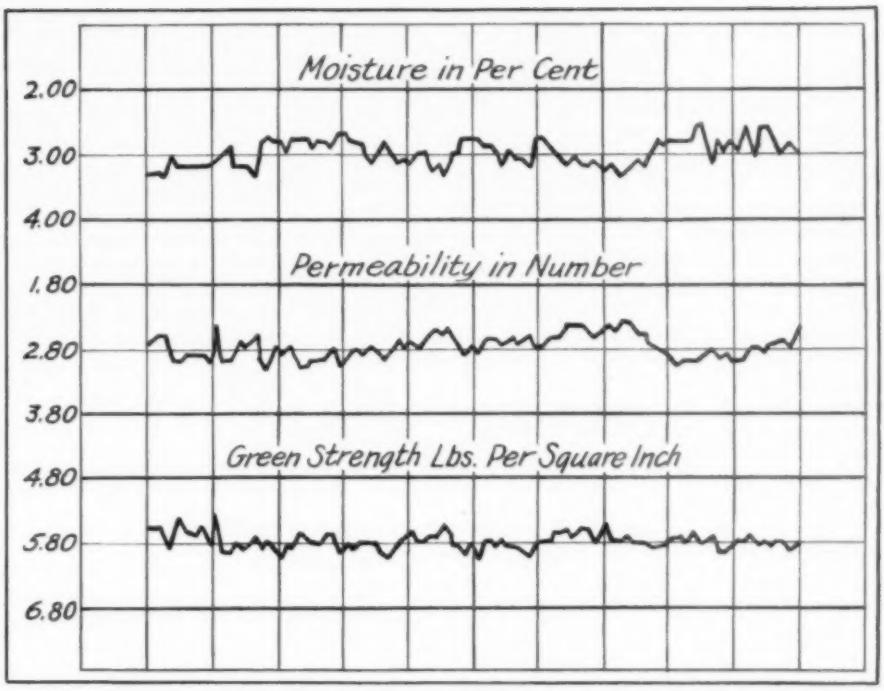

Fig. 10—Chart Showing the Results of 100 Consecutive Sand Tests

Conclusions from extensive studies of molding sands and from actual experience are that one sand mixture or formula is not sufficient for all classes of work, and as a result the company has developed in its sand laboratory a series of sand formulas for use in different classes of work. Particular requirements and conditions of customers' individual needs govern the uses of specific sand formulas to meet certain qualifications such as cleanliness, finish, and soundness. The core making department in a separate building adjacent to and opening into the main bay delivers an adequate supply of cores to the molding department.

A new oven 8 x 8 x 16 feet for baking small cores and designed by the firm, is shown in Fig. 5. It differs considerably from the older types of stationary batch ovens in that combustion takes place entirely outside the oven. That is accomplished in a separate combustion chamber shown at the right in Fig. 5. A fan or blower at the end of the chamber removes the heated air and gases from the chamber and forces them into the oven. An auxiliary blower on top of the oven draws the fumes out, and provides a more uniform temperature

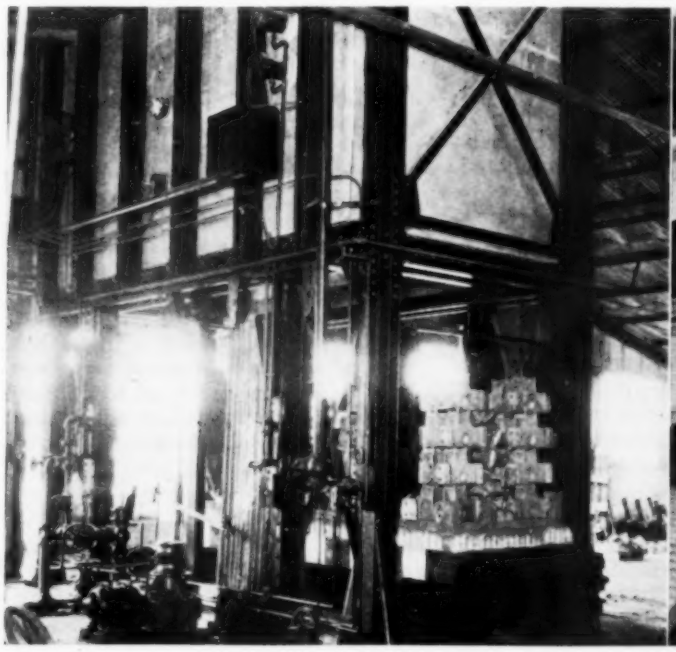

Fig. 8—Castings Are Annealed in a Vertical, Car-type Electric Furnace, in Which the Temperatures Are Controlled Automatically. Fig. 9—Pattern Storage Is Fireproof

throughout the oven. Thermostatic control for the oven was installed by the Bristol Co., Waterbury, Conn., and the gas burners were designed and installed by the Peoples Gas Light & Coke Co., Chicago. Baking time for the cores varies from 2 to 2½ hours, and the temperature from 400 to 450 degrees Fahr. depending upon the type of cores being baked.

Details of charging the scrap also have been refined. A special bottom-drop type charging bucket of 4 tons capacity, with instant release, has been designed so that the scrap falls into the furnace in pyramid position. Thus charged, the scrap remains in the pyramid pile through the first stages of the melt-down. This method of charging not only prevents the heavier scrap from wedging against the electrodes, but the arc is maintained in the scrap, and danger of the furnace lining being arced before a pool of molten metal is formed in the bottom is eliminated.

The removable roof of the furnace facilitates the method of charging. The furnace set-up permits quick handling of the metal at proper temperatures. The removable roof mechanism, as illustrated in Fig. 1, includes two I-beams mounted on track rollers. Lugs on the beams clutch companion lugs on the roof of the furnace. The beams attached to an electric hoist raise the roof and carry it back along the runway, while the furnace is being charged.

Tap Heats on Schedule

A definite schedule of tapping heats has been found essential to maintain an unbroken cycle of operation. Regulation of time of heats is in consideration of the number and types of molds available, and the necessity of returning the flasks to the molders after they have been poured and shaken out. Even with plenty of flasks available to keep the molders busy when a heat is delayed and the tapping schedule interrupted, the limiting number of molds that may be made without causing undue congestion on the pouring floor or in the molding department, is considered.

Attention is given to keeping the main foundry bay well ordered and arranged at all times as indicated in Fig. 3. The illustration also shows the location of the sand distribution belt with the sand hoppers situated directly over each molding machine. The general layout of the foundry in brief is as follows: The west or main bay at the extreme north is occupied by the large concrete scrap and sand storage bins. The shakeout adjoins the bins and the rest of the bay constitutes the pouring and molding departments. The north end of the east bay contains the ladle drying equipment. It is adjoined by the melting department which is followed by the sand conditioning equipment, the cleaning room, and the electric annealing furnace. As mentioned, the molding machines are located on either side of the columns between the two bays.

A simple, practical arrangement has been adopted for the transfer of molds from the molding department to the pouring floor. As shown in Fig. 3, the molds are placed side by side on bottom boards which in turn rest upon long steel channels. A piece of heavy 6-inch tubing, the length of the channels, is suspended from the crane hook, and two short chains with rings in the ends are attached to each end of the tube. The rings are hooked over grooves cut on the under side of the channel legs and the whole is lifted by the crane, and transported to the pouring floor

Annealing Oven Is Vertical

Castings are annealed in a car-type, vertical furnace which is electrically heated and controlled. The furnace shown in Fig. 8 was supplied by the Industrial Furnace Co., Buffalo. Castings are placed on the car which is elevated into the furnace, and secured with steel dogs to hold it in place in case of accident to the hydraulic lifting mechanism. A groove around the edges of the car filled with sand forms a seal which prevents the access of air into the furnace so that little or no scale is formed on the castings. Close temperature control is assured by pyrometric devices located at various points within the furnace.

Recently the Burnside company completed a new, 2-story pattern storage building. It is 40 x 72 feet, constructed of brick and concrete, and is windowless to add to its fireproof characteristics. Steel shelving divided into compartments by angle iron supports as shown in Fig. 9 occupies the lower floor. Each compartment is numbered, and contains the small patterns. The second floor is used for the storage of large patterns, and the steel floor is marked off in numbered sections to facilitate the location of patterns. The pattern records include a live file which indicates that the pattern is in use or in storage, and a dead file indicating that it has been returned to the customer. In addition to descriptive data on the pattern, each card contains a sketch of the pattern so that identification always is positive. When a pattern is returned from the foundry for storage, it is examined, and repaired if such is necessary. Consequently, the patterns always are ready for use when withdrawn from storage.

S. M. Kintner, formerly assistant vice president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been elected vice president in charge of engineering. He succeeds W. S. Rugg who has been elected vice president in charge of sales.

New Jersey Association Elects Directors

First directors under the new constitution of the New Jersey Foundrymen's association were elected at the final meeting of the present season at the Downtown club, Newark, May 27. The new directors will be installed in September.

The following directors were elected for a period of three years: W. H. Mantz, Atlas Foundry Co., Irvington, N. J., president, New Jersey Foundrymen's association; G. W. Hannay, Barnett Foundry & Machine Co., Irvington, N. J., secretary of the association; J. A. Williamson, Isbell Porter Co., Newark, N. J., association treasurer; and J. L. Carter, Sacks Barlow Inc., Newark, N. J.

For the two-year term the following were elected: D. L. Sacks, Sacks Barlow Foundry Inc.; H. L. Edinger, Barnett Foundry & Machine Co., V. Vandervoert, Watson Machine Co., Paterson, N. J.; and P. R. Van Duyne, Meeker Foundry Co., Newark, N. J.

Directors for the one-year term are: C. Donath, Phoenix Brass Fittings Corp., Irvington, N. J.; R. Edmundson, American Abrasive Metals Co. Inc., Irvington; George R. Farrell, Snead & Co., Jersey City; and F. Powell, West Bergen Iron Foundry, West Bergen, N. J.

Dr. John L. Davis, pastor, Greenwich Methodist church, New York City, speaker of the evening, delighted his audience with his humorous observations on life. Charles A. Klaus, cost accountant for the association, presented his observations on a recent trip, during which he visited 98 foundries in different parts of the country.

He found uniform cost methods being adopted more generally. Certain New England districts now are adopting uniform methods for the first time. However, he declared there was much work still to be done.

Meeting Is Cancelled

Steel Founders' Society of America Inc., New York, will not hold its mid-summer convention at French Lick, Springs Hotel, French Lick, Ind., June 17, 18 and 19 as previously announced. Either a regular meeting of the society will be held the latter part of June at some central point or a series of local meetings will be arranged at such points as Philadelphia, Cleveland, Detroit, Chicago, Milwaukee, etc.

Francis Buckingham has been appointed sales engineer for testing machinery and equipment by the Baldwin-Southwark Corp., Paschall station, Philadelphia. Mr. Buckingham has been engaged in the design and sale of that type equipment for the past 18 years.

Bronze Pressure Castings Require Exacting Practice

By J. E. Crown

BRONZE castings for pressure service demands a higher grade of product than is required of castings where pressure testing is not a part of the specifications. A casting apparently solid, free from surface defects, true to dimensions and fully acceptable as an ordinary casting, may fail miserably when subjected to the required pressure test for the type of castings which are under consideration.

Successful production of this class of work is possible only with a full appreciation of the various factors involved. So often the question is seen in technical papers, "What alloy should be used for pressure casting?" apparently asked with the belief that selection of the alloy would solve the problem. However, selection of the alloy is only one factor; equally important factors are: Design of the casting, design of pattern, allowance for machine finish, method of molding, character of cores, type of heads and gates.

Several Alloys Applicable

The choice of numerous alloys may be made, final selection being determined usually by other desirable properties or as a result of a manufacturer's previous success with a given composition. Following are a few of the red-bronze alloys that have been successfully used for pressure work: 88 per cent copper 10 per cent tin, and 2 per cent zinc; 88 per cent copper, 8 per cent tin, and 4 per cent zinc; 87 per cent copper, 9 per cent tin, 3 per cent zinc, and 1 per cent nickel; 85 per cent copper, 5 per cent tin, 5 per cent zinc and 5 per cent lead.

Regardless of the alloy selection, it is essential that extreme care be exercised in melting to prevent overheating, oxidation or gas absorption to obtain consistent results, uniform quality and the maximum physical properties.

Various types of furnaces are used for melting, including the pit-type crucible furnace using oil, gas, coal or coke as fuel, the reverberatory furnace or electric arc and induction-type furnace, all of which have their peculiar advantages.

The principal alloy used at the U. S. naval gun factory, Washington, for nonferrous pressure castings consists of 87.25 per cent copper, 0.75 per cent nickel, 9 per cent tin and 3 per cent zinc, made by the natural-draft pit-type crucible furnace using coal for fuel in the bed and coke for side walls.

Describes Methods

SUCCESSFUL production of bronze pressure castings is possible only with a full appreciation of such factors as selection of alloys, design of pattern, method of molding, character of cores, and type of heads and gates. Importance of those factors is pointed out by a description of the practice employed in the U. S. naval gun factory, Washington, where the author is master mechanic of foundries. The article is abstracted from a paper presented at the Chicago convention of the American Foundrymen's association.

Following is the process regularly used: The required amount of copper is melted down, protected from oxidation by placing crushed charcoal in the crucible to form a covering for the metal. If the copper, after being melted, shows any indication of wildness, a small quantity of carbon-free manganese is added (rarely exceeding 1 ounce per 100 pounds), and to this bath the nickel is added, preferably in the form of copper-nickel hardener; then the tin is added and, finally, the zinc.

The entire charge then is permitted to remain in the furnace for sufficient time to permit complete solution of all ingredients. The metal is pigged in iron molds, analyzed and later remelted for casting use, care being taken on remelting to prevent oxidation or overheating.

Proper pouring temperature is of vital importance and varies with the design of the casting. However, it may be generally stated that pouring temperature should be as low as is practical to obtain a well-run casting. The average pouring temperature at the naval gun factory is 1950 degrees Fahr.

Frequently the influence of design on the problems encountered in the manufacture of pressure castings is not appreciated. Conditions exacting the use of all the resources of the foundryman often could be improved or eliminated by some slight change in design.

Section Should Be Uniform

Wherever practical, design should permit uniform cross section of metal, or the avoidance of sudden changes from one cross section to another, keeping in mind that uniformity is desired at the time of pouring and that an allowance for machine finish may cause nonuniformity even though the finished product may be uniform.

The liberal use of fillets, avoidance of right-angle bends, maintaining of surface skin and the coring of heavy bosses are details of design which aid materially in the production of pressure castings, Fig. 1, *A* and *B*, show two methods of providing large boss on the side of a cylinder for attaching valve fitting. Fig. 1-*A*, showing a solid boss attached to a light wall, is poor design due to serious change in cross-section. Fig. 1-*B* shows the method of providing the same boss yet maintaining uniformity of cross-section.

A study of the foundry problems involved in the manufacture of pressure castings, especially those of intricate design, should begin on the drawing board. Accurate and well-designed pattern equipment is of major importance for this type of work to maintain the features studied in design, as incorrect shrinkage allowance, excessive machine finish or in-

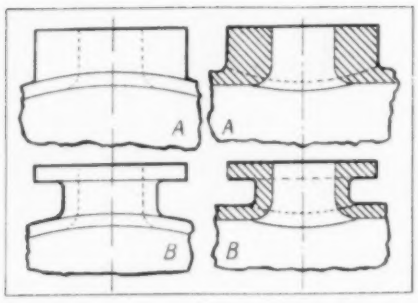

Fig. 1—Sketches A, A Show Poor Design Due to Nonuniform Section. B, B with Uniform Section Are Examples of Good Design

accurately fitting cores may defeat the object sought in the original design.

Too much stress cannot be placed upon the importance of proper machine finish allowance. As is well known, the grain size of bronze is in direct ratio to the rate of cooling—the more rapid the cooling, the closer the grain. Therefore, the metal that comes in direct contact with the mold being rapidly cooled has the best grain structure of the casting, and an excessive amount of machine finish, possibly allowed to take care of inaccurately molded castings, causes this close-grained metal to be removed by machining, thus exposing the more open-grained interior sections of the castings to withstand the required pressure.

Green Sand Is Used

Where practical, and whenever possible, match plates, set gates and similar devices should be used not only to reduce the cost of manufacture but to minimize the effects of the personal equation. If the exercise of care, accuracy and intelligent planning is important in melting, designing and pattern construction, it is doubly so in molding to obtain success and counteract the normal variables found in foundry practice.

As design has attempted to maintain cast finish when possible, and as pattern construction has provided the minimum allowance for machine finish when machining is necessary, it is obvious that greater care must be exercised in making the mold and core to insure the final product being in accordance with desired dimensions.

Pressure castings may be cast readily in green sand except for the larger class of castings, when dry sand provides a greater factor of safety. Sand control insures more uniform results.

Selection of the type and size of gates should be given serious consideration to permit the entrance of metal to mold with the least amount of agitation and to distribute metal as far as possible to permit uniform rate of cooling in various sections. Chilling of heavy bosses may be necessary so as to aid in securing a uniform rate of cooling.

In some instances it is advisable to eliminate a shrink head which would normally be used on a nonpressure casting and to resort to chills. The shrink head not only keeps that section of the casting liquid for a longer period, thus increasing its grain size, but its subsequent removal also destroys the skin effect.

Importance of the effect of the character of cores should not be overlooked, as they play an important part in the manufacture of pressure castings. Cores should be made from sands having a high permeability. The binder material should be such as will give a strong body to the core yet having the feature of disintegrating at casting temperature, to permit complete collapse of the core and prevent any restriction to the normal contraction of the casting.

Cores must be well baked and thoroughly vented to permit rapid exodus of the gases, as the slight quivering of metal around the core, although it may not prove detrimental for certain castings, will prove fatal to pressure work.

Fig. 2 shows a casting of a hydraulic cylinder 21 inches in diameter, 10 feet long, an average wall thickness of ⅜-inch, weighing 2000 pounds. This was cast in dry sand of red bronze (87.25 per cent copper, 9 per cent tin, 3 per cent zinc, 0.75 per cent nickel composition), and tested to 300 pounds per square inch pressure test after machining.

The casting was molded in a horizontal position with a split pattern, but was poured in a vertical position. A 3-inch diameter down gate was provided for entrance of the metal, which connected with a circular runner around the core print to which were attached 24 down sprues having a total volume of one and one-half times the volume of the runner to prevent nozzle effect upon the metal. The entrance gate was extended 12 inches below the runner so as to break the fall of the metal and to permit easy flow of the stream to the casting.

Reservoir Holds Metal

A brick-lined reservoir of sufficient size to hold the full amount of metal was connected to the 3-inch sprue, the reservoir being equipped with a graphite stopper to permit holding of the metal until it was quiet and of the proper temperature for pouring. A shrink head was provided by extending the pattern 8 inches.

The design of the assembled unit, of which this casting was to be a part, would not permit the use of a uniform section boss as shown in Fig. 1-*A*, but a compromise between the design of Fig. 1-*A* and Fig. 1-*B* was obtained for the rectangular pads, permitting the coring out of all excess metal and retaining only a sufficient surface as was required for attaching the valve. However, even this difference in thickness was considered too great to permit proper cooling, and the pads were chilled.

Original design of this casting required machining of the entire interior, but a later design provided four narrow bearing strips running the entire length of the cylinder with cast finish between the strips, and danger of leakage was reduced. A loam core was used so as to permit maximum unrestricted contraction and to obtain more easily the desired accuracy of interior.

Manning, Maxwell & Moore Inc., New York has closed its Chicago sales office for machine tools and overhead, electric, traveling cranes. Dean Machinery Co., Chicago, will represent Manning, Maxwell & Moore Inc., in the Chicago territory in the sales of those articles. Offices of the Dean company are located at 80 East Jackson boulevard, Chicago. Chicago offices of the Consolidated Ashcroft-Hancock Co. Inc., a subsidiary of the Manning, Maxwell company will continue without change.

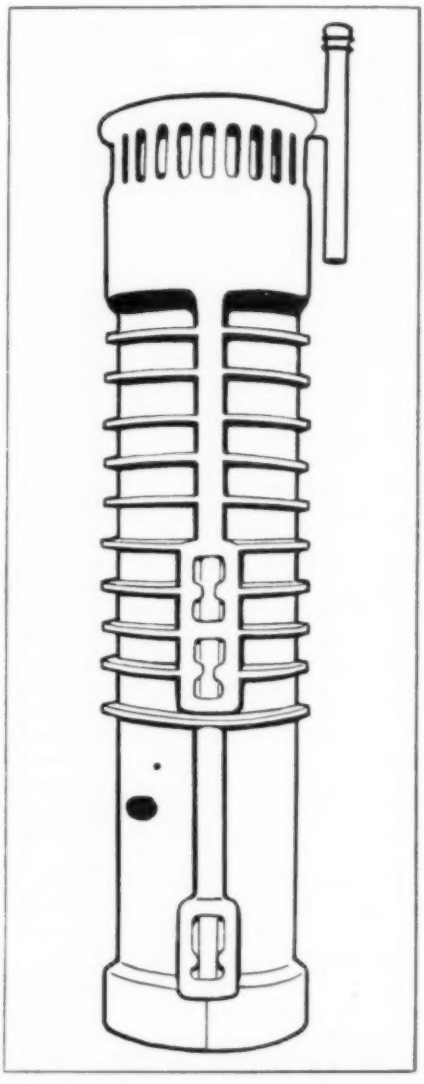

Fig. 2—Down Gate Is Connected to Circular Runner Around the Core Print

Prevent Losses With Proper Gates and Risers

By Pat Dwyer

CUSTOM has familiarized the foundry ear so completely with the term *storge gate* that few, if any, think of associating the word with storage, or suspect that storge, instead of being a perfectly good word in itself is merely a lazy or slurred contraction of storage. It is pronounced storge, sturge, starge, stor-r-r-rge, stawge and stoige by molders who claim English as their mother tongue. Sto', studge, stodge, stosh, stush represent some of the best attempts by men of foreign extraction whose first lessons in the English language were learned in the foundry.

Describes Gate Form

So completely has the original word *storage* been lost, that if a man were to use it today in the ordinary routine of shop practice, he would be regarded as somewhat of a freak. The majority of his hearers would infer vaguely that he was referring to some new type of gate. Certainly they never would associate the formal storage gate with the familiar storge they were using every day. The limited minority would resent the pedantic presentation for the same primal reason that causes the average man to resent the peculiar accent affected by actors and radio announcers.

In its simplest form the storge or storage gate includes two upright passages, one horizontal passage between the uprights, and one passage leading directly to the mold cavity. All these features are shown in Fig. 48, where *A* is the sprue, *B* is the second vertical passage, designed to serve as a riser, trap, and dirt catcher, *C* is the passage connecting the two vertical members and *D* is the gate proper, or the opening leading directly into the mold cavity.

In the illustration the mold cavity is shown altogether in the cope part of the mold, but the gating arrangement in cases of this kind is the same irrespective of the position of the mold cavity.

The foregoing arrangement presupposes a flask somewhat in excess of the size normally employed. Economy in shop operation insists on a flask as small as may be consistent with safety. The margin of sand between the casting and the walls of the flask is held to a minimum and for that reason the space available for the gate rarely is great enough to cut a storge gate in the position shown in Fig. 48. Usually the gate is formed as indicated in Fig. 49 with the horizontal passage *C* at right angles to the gate proper *D*.

Permits Many Styles

Practically without exception the passage *C* is cut in the cope, while the opening leading to the mold is cut in the drag. One of the exceptions is shown in Fig. 48 where the entire mold cavity is located above the joint line between the cope and the drag. Other exceptions, no doubt will occur to the reader's mind, but generally speaking part of the storge gate is formed below the parting line and part is formed above.

Usually the simple arrangement shown, is sufficient to insure the delivery of clean metal to the mold, but some foundrymen insist on incorporating additional safety features as shown in Figs. 50 and 51. In Fig. 50 the iron

Old Name Persists

THE storge gate, probably abbreviated from storage, is one of the first type developed for the purpose of insuring a clean stream of metal as it enters the mold. In one form or another it still is employed extensively and gives eminent satisfaction where it is constructed properly with due regard for cleanliness and other features essential to the proper functioning of any type of gate. Practically all types of skimmer gates in use today, either retain their original form, or, are variations of types that have been in use for many years. Dissemination of information through the columns of THE FOUNDRY *for the past 40 years makes it impossible at this time to assign priority in use or presentation to any given individuals. An impartial description of several types is presented.*

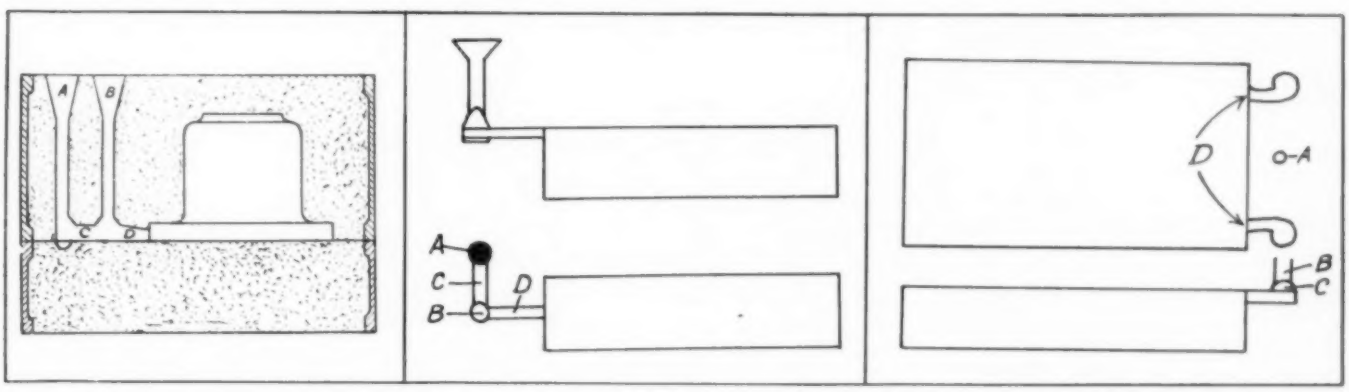

Fig. 48 (Left)—Section of Ordinary Storge Gate in Which Sprue and Riser Are in Direct Line. Fig. 49 (Center)—Storge Gate in Which Direction of Flow Is Changed 90 Degrees. Fig. 50 (Right)—Double Storge Gate in Which Sprue Serves Two Gates

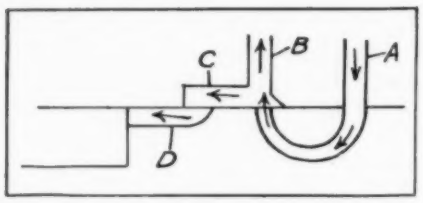

Fig. 51—Compound Skimmer Gate Combining Horn Gate with Storge

enters the mold through two gates *D D* cut in the drag. These gates are supplied by the runner *C* cut in the cope and extending from the bottom of the sprue *A* (in the center) to the dirt catchers *B B* at the extremities.

Further refinement of construction is shown in Fig. 51. The various parts in their new alignment are indicated by the same letters used in the former instances. The upright sprue *A* is continued as a horn gate below the parting line of the mold. The general direction of the flowing metal is indicated by the arrows. The bottom of the riser *B* is reamed out to serve as a reservoir or storage basin rising from the horn gate.

This is the essential or distinctive feature of the storage or storge gate. Slag or other foreign material floating on top of the metal on account of its lower specific gravity, floats to the top of the column of metal in the riser *B*, while the clean metal flows along the passage *C* to *D* and thence into the mold. To maintain a column of metal in the riser *B* it is essential that the sprue *A* be kept full during the pouring period.

Arrangement May Vary

The foregoing style of gate is shown in extension in Fig. 51 merely because it is the most convenient method of presenting it in pictorial form. In actual practice the various channels may be arranged at any angle to each other. In fact some molders prefer an arrangement in which the metal first is directed at right angles, or even in an opposite direction to that which it will follow in the actual gate opening leading into the mold.

In instances of that kind the cavity below the riser *B* is formed in a manner to impart a whirling motion to the metal and thus more effectually separate the dross from the clean metal. This feature is shown at *D D* in Fig. 50, while the action is shown more in detail in Fig. 55 a drawing originally made to illustrate the best method of pouring a ball casting. Of course, the argument is that if this method will insure a clean, solid ball, it also will insure the cleanliness of any metal which passes through it into a second mold cavity.

Another exemplification of the same idea is shown in Fig. 56 where the whirl chamber in the center receives the metal, strains it or rather separates it from any impurities and then distributes it to the various mold cavities in the vicinity, to which the chamber is connected by suitable gate passages. The sprue, as in former instances, is at *A*, while a riser may or may not be located above the ball *B*.

Open Riser Preferred

Although not actually necessary, an open riser is preferred to one that is closed, if for no other reason than the opportunity afforded the pourer to watch the top of the column of metal and thus regulate his pouring speed. Also he can notice the amount of dross appearing at the same point. An actual demonstration of this kind will do more than any amount of preaching to inculcate habits of care and cleanliness in the preparation of the gates and runners—provided the observer is seeking information and is willing to accept the evidence of his own eyes and is sufficiently intelligent to draw conclusions from the evidence presented.

After the riser has served its purpose as an educational feature on any given casting, it may be removed as part of the pattern equipment, particularly on jobs that are going into large production. The storge gate then will bear an approximate resemblance to the illustration Fig. 52. The pocket, or enlargement of the passage will suffice to collect and hold any dross floating on the metal. Removal of the riser merely is one of the minor features in the economical program under which all mass production foundries are forced to operate.

Elimination of a 10-pound riser on 1000 molds per day represents a saving equivalent to the cost of melting and handling 5 tons of iron. Not much, perhaps, in itself, but it is one of a great number of small leaks which if allowed to go unchecked drain away the profits to an alarming extent.

Several pouring methods and styles of skimmer gates are in use in addition to those outlined in preceding parts of the present series, particularly those described and illustrated in the second section which appeared in the Jan. 15, 1931 issue, and devoted to the automotive industry. Each one represents the matured judgment of a competent foundryman and one that actually has demonstrated its merit in routine practice. So far as published records go, the authors of many of these devices are unknown. In other instances the authors modestly disclaim invention. They confine themselves to the statement that they have used certain types of gates for so many years and confidently can recommend them. Other gates so clearly are modifications of a common type, that any claim to priority cannot be entertained.

Methods Open to All

For purpose of the present discussion it is sufficient to say that nearly all the methods of gating, ordinary methods and special methods, have been described in The Foundry at one time or another. In fact many of the methods have been described, and in several instances, illustrated on more than one occasion. Without a painstaking search through the files it is impossible to determine at this late date, when the first reference to any given method appeared. To avoid controversy over priority in use or presentation, reference to individual claims will be avoided as far as possible. So far as we know, with a single exception to be noted later, none of the methods is patented and none is the exclusive property of any person. Some of the illustrations are reproductions of those

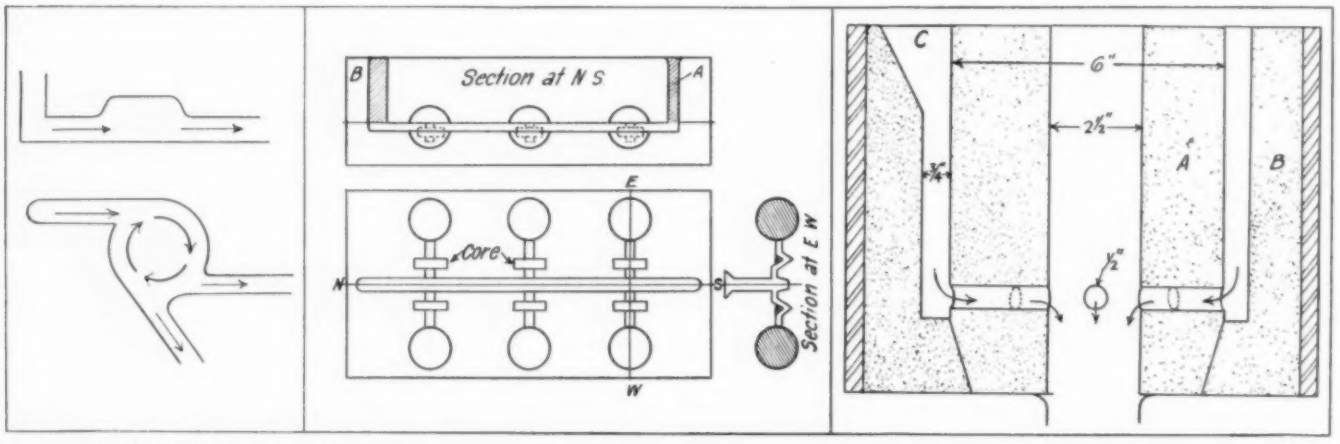

Fig. 52 (Left)—Whirl Gate with Two Branches. Fig. 53 (Center)—Plan and Longitudinal Section of Skimmer Gate Layout for Small Castings. Fig. 54 (Right)—A Dry Sand Core Forms the Center of This Strainer Pouring Basin

that have appeared before, but the greater number are original, prepared specifically for the present series.

The method shown in plan and section in Fig. 53 is a variation of the storge gate in that the metal passes under a bar or dam before it enters the mold cavity or cavities. The method may be applied to a single mold in a flask, but usually is applied where a number of molds are supplied with metal from a common runner. The illustration shows a mold containing six castings.

Metal Flows Down Runner

The hot, molten metal is poured down the sprue *A* at one end of the flask. The metal flows along the central horizontal runner which is formed in the drag part of the mold immediately below the parting line. The first dash of metal carries any dust or light debris to the far end of the runner where it floats up into the riser *B*. As it rises in the riser, the metal also fills the runner and flows into the six lateral branch gates, each one leading to a mold cavity. Each of these branches is located just above the parting line in the cope. After leaving the runner, the branch gate dips sharply downward and then rises again to the joint level at the point where it enters the mold. The dip in the gate is covered with a small triangular core which rests in suitable prints.

In the foregoing instance the central runner is formed in the drag to facilitate the entrance of clean iron into the small branch gates which cross it in the cope. Under certain conditions this arrangement might have to be reversed. For example if a heavy runner is required to feed the castings, the runner, which in this imaginary instance constitutes a continuous shrink bob, will function more effectively in the cope than in the drag. The runner in the drag might draw metal from the castings and thus defeat its natural function which is to supply metal while the casting solidifies.

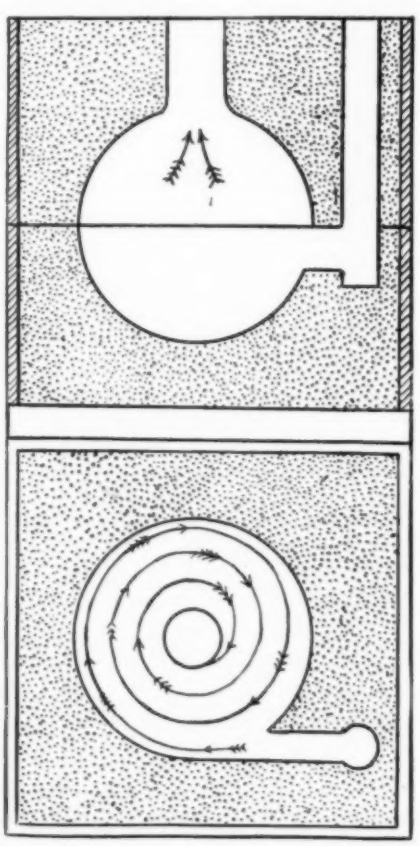

Fig. 55—Whirling Motion Carries Impurities Present To the Center and Up Through Riser

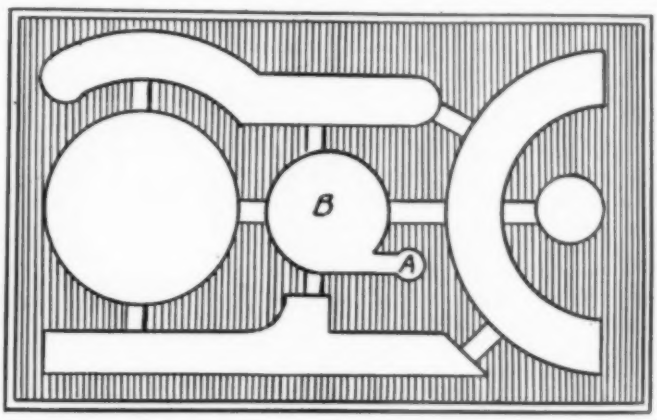

Fig. 56—Showing Method of Applying a Whirl Gate To a Number of Castings in the Same Mold

Molten metal is drawn from one part of a casting to another part during the solidification process but—and this is a feature frequently over looked—it most certainly is not drawn uphill. The various parts of the casting, the gates, runners and feeders must be arranged in a manner to harmonize with the law of gravity. Theoretically, a casting shrinks equally at all points from the perimeter to the center. As a plain matter of fact, while the shrinkage is in the direction of the center of the casting, it is also in the direction of the center of the earth.

Casting Rests on Bottom

If this was not true, every casting would be found suspended between the cope and the drag after the manner of Mahomet's legendary coffin. Actual examination of any casting while still in the mold will show that while it has shrunk away from the cope and from the side walls, it still rests solidly on the bottom of the mold.

In the pouring basin shown in Fig. 54 the storge principle is applied in an ingenious manner. One of the principal advantages claimed for this device is the simplicity of its construction and application. Practically no special equipment is required since the equipment already in existence in practically every foundry may be adapted for use. The runner basin may be made up in convenient size, depending on the amount of metal to be poured through it. The size shown, with a central sprue 2½ inches in diameter, is suitable for castings between 3000 and 4000 pounds in weight.

An ordinary solid bushing pattern with a print on the lower end is placed over the opening of the sprue on top of the cope. A ring of any kind or a runner box is placed around this bushing and green sand is rammed between the ring and the bushing pattern. At one point near the top, the sand is cut away for a distance of 4 or 5 inches as shown at *C* to facilitate the entrance of metal from the ladle to the mold.

Where these runners are made up in considerable numbers, a small wedge shaped piece of wood may be fastened to the bushing pattern to form this opening.

The inside part of the runner basin is formed by a dry sand core. The core can be made in halves pasted together, but a more satisfactory core is made in a one-piece box, or a box in which the two halves are fastened together before filling.

Use Corebox with Bottom

The box may be open at both ends—the usual type—but a corebox with a bottom at the print end is preferable, if only for the fact that a small hole in the center will serve for locating the upright gate stick. Eight ⅝-inch holes, spaced equal distances apart on a circle slightly above the print, serve to locate the eight ½-inch diameter horizontal gate sticks. These sticks, or rods, are pointed on the inner ends where the points rest in conical depressions in the upright stick, or piece of pipe, if a pipe is preferred. The outer ends project beyond the corebox where they may be grasped by the fingers and extracted after serving their purpose.

With the vertical and horizontal gatesticks in place, the corebox is filled with core sand and rammed in the usual manner. The various sticks then are withdrawn, the corebox inverted on a plate, the box rapped and removed and the core is dried in the oven.

When the time comes to make up the runner box on the mold, the core is placed in the center of the green sand runner basin. The print on the bottom fits accurately in the green sand print in the bottom of the basin. The basin is filled with iron which then flows in through the eight small gates to the upright combined sprue and riser in the center.

This is the eleventh of a series of articles dealing with the various types of gates and risers used in the foundry industry. The twelfth instalment will appear in an early issue.—The Editors.

Foundry Practice Keeps Pace *With Rapid* Industrial Developments

By Arnold Lenz

UNTIL recently an engineer's interest in the foundry was confined to designing castings that could be produced somehow. The new interest no doubt is actuated by a realization of the tremendous savings that can be effected by a better knowledge of the possibilities and limitations of foundry operations.

Many parts made as forgings, pressed and fabricated steel today rightfully belong in the foundry. The designer was willing to reduce his design to its simplest form to come within the limitations of the forge or press. Yet, when a casting is suggested, this same engineer will let his fancy roam, because he knows that through the great flexibility in foundry operations, the casting will be produced somehow.

The Chevrolet engineering department has become foundry-minded and designs no castings, even for experimental purposes, without taking the foundry into its confidence.

Co-operate in Design

A typical casting illustrates the possibilities of better co-operation. This part, in the past, was made in two pieces, part casting and part pressed metal. Last year it became evident that the design lacked the necessary rigidity, and it was decided to replace the sheet metal with a full gray iron casting on the basis that the improved performance would be well worth the extra cost. After analyzing the design, it was found that by a change we could save about 18 cents on each casting. The engineering department redesigned the job, and we had already started the production patterns when a wholly new method, not heretofore practiced in the foundry, suggested itself. The suggested change did not affect the machine shop and the engineers revamped the design. By spending about $1000 for rebuilding some obsolete molding machines we were able to reduce the cost an additional 24 cents. On a production of a million cars a year this means a saving of $180,000 from the first to the second change, and $240,000 from the second to the third change. The third change brought the cost below that of original sheet metal part.

Differences of opinion exist regarding the practicability of large foundries. Many seem certain that its possible advantages are lost through lack of attention to the innumerable small details, which have to be observed in a successful foundry.

I would not hesitate one moment to recommend doubling the present plant if warranted by the demand for castings. I know that we could not only hold our cost, but that the increase would open up new sources of saving.

Definite economic limitations, such as location, prevent growth long before the limits of good management are reached. For years our location at Saginaw was a limiting factor. We were on the north end of the automobile building district. All iron and coke had to be brought north through Detroit, Pontiac, and Flint and returned over the same route as finished castings.

The Saginaw river near the plant was navigable back in the days when Saginaw was the largest lumber producing center in the world. By building a dock and getting the war department to clean out the channel, we have now an extremely favorable location. Where formerly we had to pay $2.10 freight on a ton of pig iron from the nearest furnace at Detroit, we now can bring iron from as far as Buffalo for not much more than the cost of a transfer in the city of Detroit. Aside from lower freight we can go into other iron markets, Cleveland, Buffalo and Chicago.

Cost Systems Necessary

Due to the great quantities of material consumed and the millions of dollars spent for wages in the course of a year, items that are treated as insignificant in a small foundry assume great importance. A cost system, that misses nothing, is an absolute necessity.

On the basis of one million cars per year we have to produce 245,000 tons of good castings. That means that we have to buy 245,000 tons of iron and scrapped steel. If by one means or another we can save 10 cents per ton on the price, the freight, the handling, or on all three, we have saved $24,500. We use about 100,000 tons of coke and 122,000 tons of core sand. Even one cent a ton saved on these two items amounts to $2200 a year.

In the operating end we find the same results. Ten cents a ton saved on labor amounts to $24,500. Lowering the cost of a cylinder block 10 cents amounts to $100,000. When

Points To Savings

AT A recent convention of the Michigan Engineering society featured by a visit to the Saginaw, Mich., plant of the Chevrolet Motor Co., division of the General Motors Corp., the members were favored with a comprehensive paper on the practices and policies in that immense plant by the general manager, Arnold Lenz. Increase in size of plant opens new sources of saving. Freight rates constitute an important item on account of the vast volume of material handled. A saving of one cent per ton on the coke and sand would amount to $2200 per year. During the past 14 years the output of employe per day has risen from 150 to 585 pounds. Hard cast iron is required for patterns and corebboxes to give a year's service. Other features covered include core room equipment and practice, sand, conveyors, flasks, templets, gates, melting, coke, ventilation.

we reduce our scrap losses 1 per cent in the foundry, we save approximately $175,000 a year. Reducing our core scrap 1 per cent means a saving of $37,000.

The prevalent belief that the foundry industry has not kept pace with the rapid development in other lines, is unfounded. One of the leading automobile casting foundries of 1916 produced 150 pounds of good castings per employe. Efficiency changed little during the next 3 years. When the foundry was built in Saginaw in 1919 I set 200 pounds per employe as the goal. This goal was not reached until 1922 and 1923. In 1924 we were able to raise this to 245 pounds. With the introduction of conveyor equipment we increased this to 345 pounds in 1925 and 1926, 380 pounds in 1927, 425 pounds in 1928, 489 pounds in 1929, and 585 pounds in 1930, a gain of approximately 370 per cent in 10 years. At present for peak production we require 5128 men. To produce this same tonnage on a 1916 to 1920 basis would require a force of 19,000 men.

Explains Organization

Our organization is built up along more or less standard lines, but we differ from other large plants in that we have no assistants. Assistants as a rule lack the necessary authority to accomplish much. There is no assistant manager, no assistant superintendent and no assistant foreman of any kind. Below the general foreman of a department every man has to be a specialist. This excludes many foundry foremen with a general training, not because they could not become specialists, but because they do not want to be and resent being tied down to one job.

To get material for the top, the more promising foremen are shifted whenever an opportunity presents itself. This idea is carried even to the higher executives. To avoid spreading their interests to a point where their efforts become ineffective, they are given only a limited number of duties for which they are held fully responsible. The various departments have to co-operate with each other, and the whole is co-ordinated and tied into one unit by the manager. No method, material, or piece price can be changed or experimented with before having the manager's sanction. This avoids duplication of effort without preventing new ideas. If a man has an idea, it is fully considered. If it is old or has been rejected previously, the circumstances are fully explained. A man with a new and practical thought receives every assistance.

Only about 20 per cent of the pattern shop force are patternmakers. The others are toolmakers, machinists and handy men. To start a new job the blue prints are delivered to my office. After a method has been decided on, the drawings are turned over to men who lay out the job on sheet aluminum, including all drafts, shrinkages and other allowances. Four face plates in one corner of the pattern shop are served by the four best and most loyal patternmakers. Gradually all layout and templet work has been turned over to them. No blueprint, and seldom a layout, ever gets out into the metal pattern department. The lineup is much more efficient where tool room precision and inter-changeability are required.

To get at least one year's production out of a set of patterns, we found it necessary to make all patterns and coreboxes out of a cast

Arnold Lenz

iron with a brinell hardness of 200. This is considerably harder than iron usually used for this purpose. The difference in cost between working soft and hard iron is negligible, if electric flexible shaft grinders and scrapers are used; and not at all in ratio with the difference in wearing qualities. A soft iron with large graphite flakes becomes pitted in a short time. Long, loose pieces in coreboxes, that have to be hammered or are likely to break if dropped on the floor, are made of manganese bronze which is stiff and has excellent wearing qualities. None of the cores are bedded with sand. All driers are aluminum, cast as closely as possible to actual size to take a minimum amount of scraping. The joints are finished on grinding machines.

Unlike a foundry making fittings or similar castings, an automobile foundry has a great variety of cores, both in size and cross-sections that may vary in baking time from one to 5 or 6 hours. We have a number of vertical ovens which prove satisfactory for drying blacking or paste on dried or assembled cores. They are portable and form part of the assembly line. The cores are put in on one side and taken out on the other. They require little floor space, can be used for one kind of cores, and the speed adjusted accordingly.

Although we use approximately 883,000 cores a day we carry no stock and a allow no room for storage outside of a working float between operations. At the end of a cleaning or assembly line the cores are loaded directly on a rack, which is removed to the foundry as soon as it is loaded. There it is set directly behind the core-setter who can reach the cores without rehandling.

Most of our cores are made on machines by what a jobbing foundry would call handy men. There is no freehand venting. All vent wires are located in the core boxes or are placed on jigs. Horizontal or slanting vent wires are guided by long hardened bushings that are replaced as soon as they show wear. By this method even the most awkward novice can jerk out a vent wire 2 feet long without getting 1/32-inch off its true line. In vertical vents, as in small cores made in multiple boxes, all vent wires are placed on an aluminum frame and pushed in at one time, locating the vents by guide pins longer than the vent wires themselves.

Tests Shows Difference

A similar system is followed in placing the core wires. All core wires are cut and bent accurately in a special department and delivered to the coremakers. At a production of 6500 jobs a day we require approximately 929,000 core wires which make the employment of automatic wire cutting and bending machines practical.

Only the strongest corebinders producing the least amount of gas should be used. If core oil is used, special attention should be given its temperature range, the baking temperature at which the core is the strongest and at which it starts to weaken. Tests show that a great difference exists between the various oils on the market, some losing as high as 50 per cent of their strength in a 50 degrees temperature rise or correspondingly increased baking time.

Core sand is mixed just as dry as natural storage sand allows. For water jackets and similar sharp sand oil cores, the sand is dried thoroughly before using. This is done to speed the core making, and to get the strongest possible core out of the least amount of oil. This may explode an old theory that wet sand produces a stronger core. As a mat-

ter of fact, dry sand will give 25 per cent more strength even than sand with natural moisture out of an indoor storage. Our core sand runs about 55 average fineness and gives a good surface without restoring to blacking in but a few cores. We believe in thoroughly dried cores and excessive venting. If foundrymen would pay more attention to these two items, there would be less trouble from so-called bad iron.

Great changes have taken place in the foundry industry, and the end is hard to foresee because each new development seems to lead to new opportunities. Mechanical sand handling and conditioning systems, mold conveyors, and casting cooling conveyors have become firmly established in the modern foundry, and it takes no prophet to foretell that within a few years even the smaller gray iron foundries will find the sand handling system as much a part of their equipment as a cupola. On the face this idea might look impractical to those who are using two or three or more grades of molding sand to suit their variety of castings. In time, competition may force some of these foundries into more specialized lines, but our experience shows that one grade of sand may take a much greater variety of castings than is generally believed possible. This is especially true of synthetic molding sand.

Set Cores by Templet

Molding sand is built up exclusively from our waste core sand and a high refractory bonding clay. The same base is used for all castings which vary from a few ounces to 168 pounds on production work and up to 2 tons on the jobbing floor. Facing is used on only three of our production castings. On the others, the heap sand is built up to answer the purpose of facing.

Generally speaking, I favor larger conveyor units instead of a number of smaller ones. We have two sizes, eight, 240 feet long and six, 140 feet long. Both sizes are equally successful, but the costs are somewhat in favor of the larger units. Our large conveyors can handle 175 tons of iron in 9 hours, and we are running as high as eight different jobs on one. The smaller ones have just about half the capacity of the larger ones, and their capacity may run as low as 9 tons of small castings. Our conveyors have extra heavy chains and drives, but everything points to improved operation through still heavier construction, and we are going to try it on our next conveyor by doubling up on everything.

The usual venting of molds almost has been eliminated. Where necessary, venting is done with a special fixture which assures accurate placement. Practically all cores are set through metal fixtures and also checked in the molds with templets, located from the pin centers. The cores are cleaned, ground, and inspected with templets in the core room, and no molder is allowed to file or scrape a core in the foundry. All castings are poured through strainer gates and no risers or flow-offs are used on any production castings. We found quite some time ago that that was not only unnecessary on our castings but actually a detriment.

Molding machines are all standard types but with more and more application of the rolloff principle. Outside the jobbing floor we have done away entirely with hand ramming. Rollover machines are used where green sand cores are too deep to lift without special arbors.

Squeeze the Mold

We give a mold a few jolts and then set the sand tight to the bars with a heavy squeeze. Where we formerly used a 12-inch squeeze cylinder, we now use a 16-inch; and instead of a 11-inch cylinder as a minimum for small molds, we are now inclined to make a 14-inch squeeze cylinder our minimum.

To avoid the old objection to squeezing, all squeeze plate are worked out with projections for deep pockets and reliefs for high points. This way we absolutely can control every part of the mold. This change also has increased the machine production to a point where a molder can produce almost as many molds in an hour as he formerly produced in a day.

Since the introduction of hot blast, there has been no new development in melting equipment that could find a general application. There seems to be quite a tendency toward duplexing with the electric furnace. I can see a benefit where small quantities of special or pearlitic irons are required, but under ordinary circumstances, I think it an unnecessary expense. We have not yet reached the limit of cupola iron.

The basic reason for using cast iron to so large an extent is its nature and price. It always will be used where weight, rigidity and vibration absorbing qualities are required. In most cases a slight increase in cost for refining, beyond melting the iron in the cupola, is objected to. It is one reason why the high strength irons we are capable of making now are not more commonly used. Outside of a few special uses no one wants to sacrifice cutting speed or pay the higher price.

There has been a great improvement in ordinary cast iron (under 36,000 pounds tensile strength) over the past 5 or 6 years. We produce iron consistently within close limits in brinell hardness, tensile strength and machinability. Until a few years ago the poor wearing quality of a cylinder was due to the great difference in hardness between the projecting flanges and the cylinder bores and valve seats. The flanges had to be machined and therefore controlled, the hardness of the bore. By the proper selection of raw material we have gradually reduced these two extremes to a point where a block can be machined at 90 feet a minute with a bore that does not exceed 2/1000-inch wear in 20,000 miles even under the most severe conditions. Since this has been accomplished through finer and denser grained iron, spongy bosses and leaky sections practically have been eliminated.

A few years ago, when engineers began to insist on harder and stronger iron with better machinability, we found that high temperatures were quite a factor in obtaining results. I had maintained for years that a lot of good pig iron was ruined in the foundry and a lot of poor pig iron could be improved by hot melting in the cupola. We gradually raised our temperature to around 2850 degrees Fahr. at the spout. Still higher temperatures are possible, but this is about all our present cores and molds will stand. Our present system does not lend itself readily to cooling the iron before pouring.

Define High Coke Ratio

There has been quite a remarkable improvement in the quality of coke, especially in speeding up combustion. We consider this factor quite important. We are now able to melt quite easily, 24 tons per hour in a furnace, rated at 17 tons. On a recent occasion when we needed extra iron, we pushed this up to 30 tons per hour without impairing the quality of the iron in any way. Aside from the speed we also have been able to raise our coke ratio. A few years ago iron with a temperature of 2700 degrees Fahr. at the spout and a coke ratio of 6½ to 1 was considered quite good for an automobile foundry. Today we have a temperature of 2850 degrees Fahr. at the spout with a coke ratio of 8.6 to 1. Still higher coke ratios are possible, but the benefits of high temperature will more than pay for the extra coke.

Mechanical charging of cupolas has become quite established, but great care should be taken in selecting the proper equipment. Not only should even charging of coke and iron be a requisite, but the equipment should permit the charging of any kind of available raw material, otherwise, it easily can become a liability.

In 1916, all cylinder blocks and heads had to be left in the molds from 9 to 11 hours before shaking out to prevent cracking. Today everything is shaken out red or white hot without any bad effect. This alone shows the big change in

this type of iron in the last 10 to 14 years. This ability of our present iron to withstand sudden and unequal temperature changes practically has eliminated cracked automobile heads and blocks.

A cooling system cools the castings on the way to the cleaning room. The cylinder blocks are still red hot when the cores are knocked out with a vibrator. They are black hot when they come out of the first sandblast, and a lot of them are still too hot for the bare hand when they reach the shipping dock although they have been ground, chipped, water-tested, sandblasted again and inspected.

Need Maintenance Force

The rapid mechanizing of foundry operations naturally had quite an effect on our maintenance organization. Where a few years ago our maintenance could be handled by a few good pipefitters and millwrights, we require today an engineering department and the leadership of trained engineers. Due to the ever present sand, dust and hot iron, the wear on equipment is heavy. To keep it in running order, our maintenance personnel comprises about 7½ per cent of our force. Through strengthening weak parts and the use of dustproof ball or roller bearings, we constantly are improving conditions, but much is still to be accomplished before we get our equipment as free from breakdowns and interruptions as is equipment in some other industries.

Old System Is Faulty

General ventilation of foundry buildings does not answer the purpose any more. The old system that depended on the smoke and gas going out through the roof in most cases helped the men employed at a shakeout or pouring station very little or not at all, because the smoke had to get past the men to get up to the roof. Efforts should be directed to keep the smoke and gas away from the men. This is impossible by general ventilation. Every smoke or gas producing point has to be isolated and treated separately. Fresh air must be brought directly to the spot where it is required and should be in direct proportion to the amount of air removed by the exhaust system. If this is not done, some of the blowers will draw on each other, especially in cold weather when windows are closed and ventilation is needed most. Outside of a few pouring and shakeout stations, all incoming air should be heated during the winter months.

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under This Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Takes Pride in Industry

TO THE EDITORS:

After looking over the April 15 issue of THE FOUNDRY, one can have quite a little pride in being connected with an industry that is thought well of by so many lines of endeavor and, at the same time, proud of the fact that the editors of the business paper representing that industry are wide awake enough to collect such a number of recommendations for the industry. I think you have done a really fine job.

DON MCDANIEL
Vice President
The Hamilton Foundry & Machine Co., Hamilton, O.

Should Assist in Selling

TO THE EDITORS:

The April 15 issue of THE FOUNDRY is certainly a creditable effort and one which should assist materially, not only in selling the importance of castings to consumers, but to producers themselves. Unquestionably some foundrymen have lost faith in their product without reason and endorsements of the kind you have obtained should help such to get a new hold on themselves.

In this week's *News Letter* to member companies, we are calling attention to the issue and there may be specific ways in which we can assist in furthering the good cause undertaken by you.

ROBERT E. BELT
Secretary-Treasurer
Malleable Iron Research Institute, Cleveland.

Is Wonderful Issue

TO THE EDITORS:

The pre-convention issue of THE FOUNDRY is a wonderful production among magazines in any line of endeavor.

I congratulate you.

ROBERT E. MASTERS
Subscriber since 1892
4045 *Eagle street, San Diego, Calif.*

Industry Needs Publicity

TO THE EDITORS:

I am sure that the departure which you inaugurate in your April 15 issue in asking authorities in their branches of industry to comment upon the foundry industry and its relationship to their particular activity is most valuable.

We all recognize that our industry needs publicity of this type and I feel that you are to be congratulated on the forward step you have taken.

ARTHUR J. TUSCANY
Manager
Gray Iron Institute, Cleveland.

Shows Initiative

TO THE EDITORS:

Permit us to congratulate you upon the unusually fine edition of THE FOUNDRY just received. You certainly have shown real initiative and enterprise in selecting the articles for this issue, which we are sure will surprise and please most of your subscribers.

O. L. JONES
President
Illinois Clay Products Co., Joliet, Ill.

Outlook Is Gloomy

TO THE EDITORS:

An article appeared in a recent issue of THE FOUNDRY under the title: "Teach Foundry Practice at Night School." This would be a good idea if foundry practice was standardized. At present it is not. I doubt if you could find two foundry superintendents to agree on any one thing. What one would teach another would not allow to be used.

They do not agree on sand or sand mixtures for molds or cores; on gates and risers; on volume and pressure of the blast in the cupola. Some of them think a man must be practical, while others seem to think that all he needs is technical knowledge. Under present day foundry conditions there is no inducement for the ordinary man to acquire technical knowledge. He can spend time and money in the acquisition, and then finds at the end of the course that he is just about on a par with the man who has had six months practical experience. The superintendent either ignores or actively opposes any suggestions. This feature was touched upon in a recent issue of THE FOUNDRY under the heading *Reader's Comment.*

Today in some foundries you will find a manager, a superintendent and a foremen for every dozen men, also a foundry engineer, a metallurgist, chemist, a chief time keeper, an office manager, a purchasing agent, a cost accountant, a production manager and others that go to swell an immense and unnecessary overhead burden. Under a proper system of practical and technical training men could be found to combine several of these positions.

A great deal of the work in the foundry is hard and heavy. A real man is needed to stand up to work, but the

pay is neither hard nor heavy. Most of the money is wasted in overhead. If an ordinary individual suggests a method of reducing the overhead, he is fired. If the superintendent reduces hours and wages, he is given a medal. A real, practical man can see unnecessary cost and waste, but his superintendent won't take advantage of this knowledge. He is the big boss and does not need any assistance. He spends most of his time loafing in the office while his assistant does the work—without any credit. Any system of teaching foundry practice should include a course on the development and necessity of harmony and good fellowship between those in exalted and those in subordinate positions.

PRACTICAL FOUNDRYMAN

Detroit

Cites Theory on Shrinkage

TO THE EDITORS:

I note in your March 15 issue a letter from a foundryman who stated that in England, on the Continent and in the Far East foundrymen generally preferred iron with phosphorus between 0.85 and 1.25 per cent.

I spent some time with the writer of the letter: he told me that British foundrymen who have had experience with both high and low phosphorus irons were generally of the opinion that the former would make sounder castings for the reason that phosphorus tended to eliminate shrinks and spongy cavities.

My observation has been in exact accord with what seems to be the conclusion of the foundrymen across the water. I have visited almost every foundry in the South where practically all pig iron melted contains phosphorus from 0.70 to 0.95 and have talked with several hundred Southern foundrymen about their difficulties in making sound castings. I have found cases of high-phosphorus iron with shrinks and spongy cavities rare even where gating and cupola practice were poor and silicon higher than it should be.

Some time ago a foundryman who has had extensive experience with both high and low phosphorus iron told me he has found that phosphorus has a decided tendency to eliminate shrinks and spongy cavities. He also stated that it is often necessary to use nickel to make low-phosphorus castings sound but that he had found phosphorus quite as effective as nickel in helping to eliminate visible defects in castings.

Recently I visited a foundry where the mix had been changed from one with 50 per cent pig with 0.04 phosphorus and 50 per cent pig with 0.80 phosphorus to a mix in which all the pig iron contained 0.80 phosphorus. The superintendent of this foundry said that test bars from the high-phosphorus mix broke just as high as those from the low-phosphorus mix and as soon as he increased phosphorus, all kinds of defective castings were almost completely eliminated.

The same writer in March 15 issue of THE FOUNDRY also stated that European foundrymen prefer low silicon iron for heavy castings. American foundrymen seem to agree that high-silicon iron is much subject to shrinks and spongy cavities.

Granting that high-silicon iron causes shrinks and spongy cavities, let us look at some of the analyses of castings with these defects as they were reported in question and answer department of THE FOUNDRY. For the past several months I have saved all such analyses which were as follows: Silicon 1.70, phosphorus 0.16; silicon 2.09, phosphorus 0.17; silicon 1.56, phosphorus 0.29; silicon 2.32, phophorus 0.24; silicon 2.69, phosphorus 0.75; silicon 2.40, phosphorus 0.75; silicon 2.62, phosphorus 0.67; silicon 2.40, phosphorus 0.75.

Note that no case of shrinks or spongy cavities was reported with low-silicon and high-phosphorus in the casting. It seems probable that the defects in the high-silicon castings were caused by the silicon and not by the phosphorus; in the low-silicon castings, the defects were probably caused by the absence of phosphorus.

There is ample reason why the low-phosphorus castings showed shrinks and spongy cavities; with the low-phosphorus iron, the metal does not assume much of a semi-fluid state in the mold and for that reason the pressure of the molten metal will not properly feed the cavity.

Of course the above is only a theory; but it is a sound theory and the facts seem to support it.

Yet I note that occasionally in your question and answer department, someone recommends reducing phosphorus to eliminate shrinks and spongy cavities. Can he or anyone else cite a single case where phosphorus was responsible for such defects?

HENRY CLARK,
Foundry Engineer

Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.

Favors the Closed Riser

TO THE EDITORS:

I have enjoyed reading Pat Dwyer's articles on gating and feeding castings. He goes into the subject thoroughly and covers every phase of gating and feeding, known and unknown, to foundrymen.

At times he almost persuades one that gating and feeding properly applied, are the only remedies necessary to cure the many ills that befall castings found in the scrap heap.

In one issue of THE FOUNDRY he states that there is no need of bad castings if the molds are gated correctly and the proper risers used. If this is what he said, I think he really meant that a large percentage of defective castings result from improper gating and feeding.

He claims that a closed or covered riser is of no benefit if the mold is made properly. There may be no benefit derived from the use of a closed riser on many light castings and on some heavy castings, but there is a decided benefit in the use of a closed riser on many molds for heavy castings.

For example consider the mold for a plate 4 feet wide, 8 feet long and 5 inches thick. With the risers closed tightly a pressure of air exerted against the cope face of the mold until the mold is filled, helps to prevent the cope surface of the mold from burning down before the metal rises to it. Burning down means the cracking and curling of the cope surface when subjected to the intense heat of the metal rising to it. Little is required to hold this surface in place. Air pressure caused by the metal filling the mold cavity and other gasses that are created often are sufficient, when the risers are closed tightly. Where the mold is poured too slowly the air and gasses escape and do not act as a support. The face burns down.

At one time or another, we all have had the cope part of our mold pull down even with our risers closed. Our remedy was to increase the size of the gates and keep the risers closed.

Mr. Dwyer states the riser covers would not be necessary if the mold was properly made. This is true. We can produce a mold that will not burn down with the risers open. We can make it in dry sand, surface nail the cope, and use special open, strong sand. However, it is much cheaper to make a good casting with an improperly made mold and a covered riser.

He stated: "All the air and gas will find its way through the sand." This is true, but it will not find its way through the sand in the cope until the mold has been filled with metal.

The instant metal enters the mold, a current of air is driven toward the open riser. This current carries any small particles of sand in the mold and deposits them in a heap near the open riser. Unfortunately very little finds its way out through the riser. This current of air also works on any delicate sand sections in the mold and carries them away. Sections that otherwise would remain intact with the risers closed and with the metal flowing gently around them.

It might be contended that any part of a mold that would not stand a current of air would not stand the flow of the metal. This is a mistake. Metal can be led into a mold by proper gating so it will not injure these delicate sections, but it is not possible to control or direct the current of air in the same manner.

(*Continued on Page* 71)

Personnel of the Foundry and Pattern Shop Departments, Which Were Awarded Cast Bronze Plaques for Having No Accidents During the Year of 1930

Naval Shops Run Over 7 Years Without an Accident

By E. B. Fenner
Rear Admiral, U. S. Navy

AS COMMANDANT at the U. S. naval station, Cavite, P. I., it is my pleasure to write to you regarding what I consider one of the finest records in accident prevention that has come to my attention. The pattern shop and the foundry shop at that station have a record of 7½ years without an accident. By an accident I do not mean a *loss time accident* but any accident of any nature whatsoever requiring medical treatment. Approximately 90 men are employed in the two shops and the work undertaken is similar and equivalent to the type of work undertaken in the larger navy yards in the United States.

When one considers the working conditions in these shops, the record is even more remarkable. Few of the workmen are familiar with shop practices and mechanical processes usually are foreign to them. A diversity of languages is spoken in the shops: Chinese, Spanish, two or three native dialects and a smattering of English. Human life and suffering have not been considered in the past in the Far East thereby making the task of selling *Safety First* extremely difficult. I consider the credit mainly due to the untiring efforts of W. B. Blount, master molder, who is in direct charge of both shops. Mr. Blount also has been assisted ably by G. W. McAfee, quarterman molder.

The Cavite naval station is located about 12 miles from Manila and is today one of the most important of our naval stations. The entire repair work for our Asiatic fleet is accomplished here and at present over 4200 men are employed.

The accompanying illustration shows the presentation of two cast bronze plaques to the two shops having no accidents in 1930. Incidentally, these were the only two shops that were awarded plaques. The plaques were presented by the yard manager, Capt. I. I. Yates, construction corps, U. S. navy, and he was assisted by the outside superintendent, Lieut. Commander R. S. Hitchock, construction corps, U. S. navy.

British Award Medals

At the opening session of the British Iron and Steel institute meeting held May 7 and 8 in London, the Bessemer gold medal was presented to Prof. Harold Carpenter, Imperial College of Science and Technology, London, by Col. Charles Wright, Baldwin's Ltd., the newly elected president of the institute. The presentation was followed by the presidential address, and the technical sessions in which a number of papers relating to the steel industry were discussed.

On May 8 the sessions opened with the announcements of the Andrew Carnegie Research scholarships for 1931-1932, and the president awarded the Carnegie gold medal to Dr. E. Valenta, Skoda Works, Pilsen, Czecho-Slovakia, and the Williams price of £100 to Frank Bainbridge, Saltonburn-by-the-Sea, for the paper possessing the greatest interest presented during the year. Several papers then were presented for discussion including "The Effect of Carbon and Silicon on the Growth and Scaling of Gray Cast-iron," by Dr. A. L. Norbury and E. Morgan of the British Cast Iron Research association, Birmingham.

The authors had investigated gray cast-irons having total carbon contents between 4.0 and 2.1 per cent, and silicon contents between 1.6 and 7.6 per cent. The tests made showed that as the silicon content is increased up to 3 or 4 per cent the growth increases, but with still high-

er silicon contents of over 4 per cent the growth in irons having not too large graphite flakes, decreases to a small figure. Irons containing from 4 to 10 per cent silicon in conjunction with graphite in a finely divided condition are being developed commercially under license by members of the British Cast Iron Research association for growth and scale-resisting purposes, and if properly made give satisfactory results.

During the discussion, Prof. Carpenter mentioned that he understood that the scale referred to in the paper is really an extreme form of growth. He said there are two types of problem: In the first case, irons are to be submitted to prolonged heat, and in the second case are rapidly taken over a wide range of temperatures. The latter is the more difficult of the two problems. The speaker mentioned that he had used this type of material on furnace structures, and that the results bear out what the authors say. The parts referred to by the speaker were immune from growth after five months practically continuous use. He suggested that perhaps such irons could be used for making containers for molten metal.

In replying, Dr. Norbury said that these irons are not suitable for ingot molds, as they are too brittle. The iron is only slightly more expensive than commercial iron, but the research association now is building up a more ductile iron, which, on the other hand, would be much more expensive. Irons containing up to about 5 per cent silicon are easily machined. at present they are not exactly suitable for melting pots heated by oil.

Reviewing New Books

Worth While Literature Covering Numerous Problems Pertaining To Foundry Practice, Management, Merchandising and Research

Insuring Unemployed

Unemployment Insurance in Great Britain, by Mary Barnett Gilson, cloth, 6 x 9 inches, 560 pages, published by Industrial Relations Counselors, Inc., New York, and available from THE FOUNDRY, Cleveland, for $5.00 plus 15 cents postage and in London from the Penton Publishing Co., Ltd., Caxton House Westminster, for 20s, postage extra.

The British unemployment benefit plan, originally put into effect in 1911 as an insurance system under which compensation was to be paid to contributing laid-off workers on an actuarial basis, today presents the spectacle of one of the greatest social-economic experiments ever attempted, hovering on the brink of a crisis and which, unless rigorous measures are taken to control its expenditures, threatens to impose an insupportable burden upon the national treasury.

The chief reason for this situation is that the acturial limitations of the insurance plan have been sacrificed, step by step, under the tremendous pressure of post-war industrial readjustments and prolonged business depression, to humanitarian considerations and political exigencies.

The author traces the history of the development of various relief measures dating back to the Elizabethan statute of 1572 and shows the manner in which public charity responsibility was assumed first by the trade unions and then passed back to the government. Various measures of unemployment prevention and reduction are analyzed and the benefits as well as the evils of unemployment insurance are clearly set forth.

The benefit of a study of this work under present business conditions in America is evident, as increasing pressure is being brought upon legislative bodies to enact measures that will duplicate some of the earlier experimental steps that have been tried in Great Britain.

An appendix analyzes a great number of individual benefit plans set in force by British firms and their employes. Complete employment statistics and summaries of unemployment acts from 1920 to 1930 with the personnel and organization of official bodies and listed references completes this valuable reference work.

Alloys Are Listed

Metals and Alloys, cloth, 136 pages, 5¾ x 8¾ inches, published by the Louis Cassier Co. Ltd., London, England, and supplied by THE FOUNDRY, Cleveland, for $2.65, and in London by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster, for 10s postage extra.

This book gives an excellent indication of the progress in science and practice of metallurgy during the past ten years. The previous edition contained the percentage compositions of some 500 metals and alloys, while the present book lists about 3500 alloys. The listing is alphabetical beginning with accumulator metal (which on this side would be storage battery lead), and ending with ziskon, a metal containing 40 per cent zinc and 60 per cent aluminum. In many instances the alloys are listed under a collective head, and under a trade name. For example under acid resisting alloys the name ferron appears, and it is found also in its proper place alphabetically.

While the book is entitled *Metals and Alloys*, the headings of the tables giving the compositions are "Percentage Compositions of Nonferrous Alloys" which woud lead one to believe that only nonferrous alloys are listed. However, the selection of the title is not quite correct because while the majority of the alloys mentioned are nonferrous, quite a number of alloys containing 50 per cent and over of iron are mentioned such as calite, Krupp V2A steel, Ludlum steel, etc.

British Practice Described

Practical Iron Founding; by J. G. Horner; cloth; 409 pages 5 x 7 inches; published by Isaac Pitman & Sons, and furnished by THE FOUNDRY for $3.00; in London by the Penton Publishing Co. Ltd., 116-17 Caxton House, Westminster, for 15s, postage extra.

This, the fifth edition of a well known work, has been revised by Walter J. May. It contains considerably more material than any of the preceding editions. The machine molding section has been completely rewritten, additional examples of molding practice have been introduced and several new chapters added. While the basic and elementary features of iron foundry practice are the same in all countries, the descriptions of molding, core making, melting and the materials employed are distinctly British and for that reason will appeal more to British readers than to readers on this side of the Atlantic.

Material Standards Designated

Standards of the American Society for Testing Materials, 1930, in two volumes, Part I—Metals and Part II —Nonmetallic Materials, 1000 and 1214 pages respectively, 6 x 9 inches, cloth or half leather, published by the American Society for Testing Materials, Philadelphia, and supplied by THE FOUNDRY, Cleveland, for $7.50 for each volume singly or $14 for both parts in cloth; half leather, $9 each volume singly or $17 for both parts, postage 15 cents per volume extra. In London the volumes may be purchased from the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster.

Every three years the American Society for Testing Materials issues its new edition of authoritative standards for engineering materials. Part I on metals contains 179 standards covering steel, wrought iron, pig and cast iron, ferroalloys, nonferrous metals, and miscellaneous subjects. Part II on nonmetallic materials contains 251 standards on cement, lime, gypsum, concrete and aggregates, brick, refractories and tile, preservative coatings, petroleum products and lubricants, road materials, waterproofing and roofing materials, rubber products and insulating materials, textile materials, and coal, coke, timber and miscellaneous materials.

The FOUNDRY Family Photograph Album

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Upper Left

H. H. WARNER

Arcade Malleable Iron Co., Worcester, Mass.

Upper Right

J. J. BAUM

Steel Founders' Society of America Inc., New York

Lower Left

E. W. SMITH

Crane Co., Chicago

Lower Right

J. F. GAFFNEY

Bethlehem Steel Co., Chicago

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

HOW TO INCREASE BELT CONVEYOR LIFE

By W. E. Philips

A question that greets me throughout my travels is—How can conveyor life be increased? In answer I would say that five simple things materially increase the life of the average belt conveyor installation.

The data to be presented are based on the assumption that when the conveyor was originally installed the idlers were lined up square with the belt; that an experienced engineer's advice was taken when determining on the belt design for the material to be handled; and that the belt was lined up correctly with the idlers.

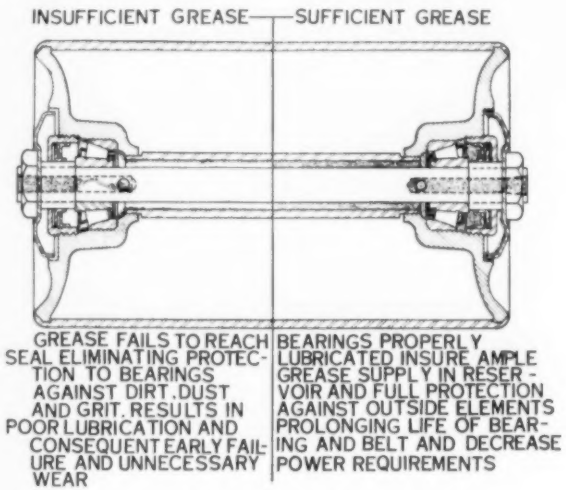

INSUFFICIENT GREASE
SUFFICIENT GREASE
GREASE FAILS TO REACH SEAL ELIMINATING PROTECTION TO BEARINGS AGAINST DIRT, DUST AND GRIT. RESULTS IN POOR LUBRICATION AND CONSEQUENT EARLY FAILURE AND UNNECESSARY WEAR
BEARINGS PROPERLY LUBRICATED INSURE AMPLE GREASE SUPPLY IN RESERVOIR AND FULL PROTECTION AGAINST OUTSIDE ELEMENTS PROLONGING LIFE OF BEARING AND BELT AND DECREASE POWER REQUIREMENTS

Fig. 1—How To Lubricate Idlers

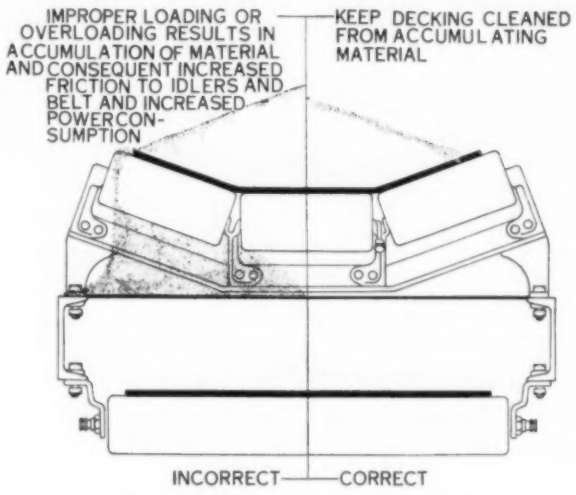

IMPROPER LOADING OR OVERLOADING RESULTS IN ACCUMULATION OF MATERIAL AND CONSEQUENT INCREASED FRICTION TO IDLERS AND BELT AND INCREASED POWER CONSUMPTION
KEEP DECKING CLEANED FROM ACCUMULATING MATERIAL
INCORRECT
CORRECT

Fig. 2—How To Keep Idlers Clean

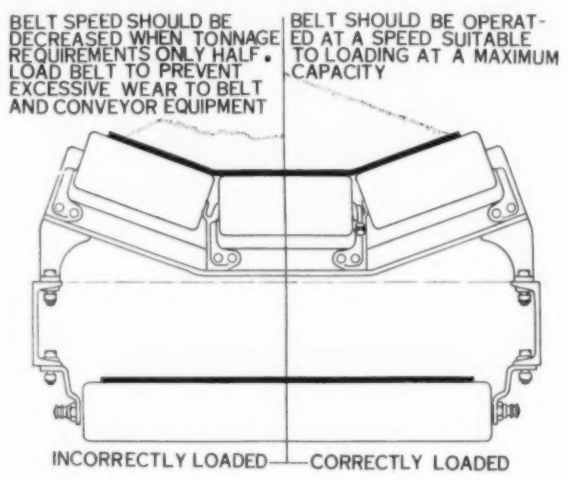

BELT SPEED SHOULD BE DECREASED WHEN TONNAGE REQUIREMENTS ONLY HALF LOAD BELT TO PREVENT EXCESSIVE WEAR TO BELT AND CONVEYOR EQUIPMENT
BELT SHOULD BE OPERATED AT A SPEED SUITABLE TO LOADING AT A MAXIMUM CAPACITY
INCORRECTLY LOADED
CORRECTLY LOADED

Fig. 3—How To Load Conveyor

Even though the original installation was correctly engineered, it requires some attention, to get the best results afterward, just as an automobile does if the utmost satisfaction is desired.

The five things to which I refer are:

LUBRICATION—Sufficient greasing as shown in Fig. 1 with the proper kind of grease, although infrequently needed.

CLEANLINESS—Keep the space under the belt clean. Clean the decking when material overflows and threatens to clog the idlers as depicted in Fig. 2. Clog-

Courtesy of the Link-Belt Co., Chicago.

(*Concluded on Data Sheet No.* 866)

HOW TO INCREASE BELT CONVEYOR LIFE

(*Concluded from Data Sheet No.* 865)

ging increases the friction load, resulting in greater power consumption and wear on the driving mechanism as well as the idlers and belt.

LOADING—Do not overload. Correct and incorrect loading are shown in Fig. 3. Use an idler sufficiently heavy, and a belt designed for the service expected. Have material reach the belt in the same direction the belt is moving and with as little impact as possible. Use feeders when necessary as they create a steady flow of material without shock to the conveyor.

WEAR—There are many reasons for uneven or premature wear on belts and idlers. Belts scraping against framework, skirtboards, or wedged material are the chief causes. Dragging idlers, caused by insufficient lubrication, or clogged rolls, cause undue wear on both the belt and idler, and put an extra load on the driving mechanism.

TRAINING THE BELT—Train the belt while empty, then if it runs out of line when loaded it is because of unequal loading. Fix the loading chute or install a feeder. Adjustment cannot be made by taking up the take-ups on one side or the other. See that the belt contacts the center roll of the idler because this roll steers the belt. Foundations for the idler should be firm and secure. Side, or guide idlers, should not be used when training the belt. Do not increase belt tension as this will injure the belt without obtaining the desired results.

YOUNG MEN —How To Attract Them

By
C. J. Freund

WE PROMISED to tell you about Leslie Parker and how his problem of finding an apprentice job was solved and here goes.

It all started when Les went to the public employment office for information about foundries in the community where apprentice training could be had. He had never before visited the public employment office. There were a great number of men standing around in the outer office and in the street outside. Most of them seemed to have nothing to do. A few talked quietly but most of them were looking blankly into space or staring idly at the large blackboard on the wall where requests for molders, toolmakers and other skilled mechanics had been listed.

The outer office was dirty and littered with torn newspapers. The men suited the surroundings, with few exceptions. The majority wore threadbare, dirty clothes and several days' growth of beard and most of them had a neglected, dejected appearance.

A dozen or so were waiting in line to be interviewed in one or the other of the five or six small private offices behind the railing and Les joined them to wait his turn.

When he had worked his way up he told the clerk that he wished to speak to someone regarding apprentice training in the foundry business.

"All right, brother, the last door," the clerk answered mechanically. Leslie had expected to be sent to that office. The sign on it read "Juvenile and Vocational."

The man in this office was fleshy, ruddy and jolly. For a moment Les thought how pleasant it would be if he could work for him. He laughed heartily when Leslie told him of his fruitless search for a foundry apprenticeship in the city.

"It's too bad, all that time was wasted," he said. "I wish you had come here right away because I could have put you on the right track. In many ways our foundries are fine institutions but in the matter of apprenticeship are woefully lacking.

You'll Know the Business

"You should go to the Jamieson Foundry Co. at Porter. They have a real training program. If you finish that you'll know the business and be able to get a job anywhere."

And so it was that before three o'clock Les was aboard an electric suburban car on his way to Porter and the Jamieson plant.

Porter was a suburb about 10 miles south of the city. Les had often heard of the Jamieson apprentice course but had never gone there because the thought had never entered his mind that in all the foundries of his city, not one effective apprenticeship was established.

Les had determined to ask the conductor how to reach the Jamieson foundry when the car passed a large sign "Jamieson Foundry Co." At the next stop he got off the car and walked back and encountered the inevitable watchman with gray hair and a star on his coat.

"Hello, boy, what are you looking for?" he called out cheerfully.

"Can I get an apprentice job here?"

"I guess you can. We've got a lot of apprentices. I thought that was what you were after. Go into the employment office over there and ask for Mr. Jenkins. He'll tell you all about it."

The employment office was on the far side of a small yard and opposite the main office. Beyond them rose the steel and glass walls of a tall foundry building and in the distance Les could hear a metallic roar which, he knew, emanated from the cleaning room.

An information clerk just inside the employment office looked up as he entered and said smiling, "I bet you want to see Mr. Jenkins."

"Yes, I do," Leslie answered, cheered by the good nature of the other so that he smiled involuntarily himself.

"I'm sorry, but you'll have to wait for a little while because Mr. Jenkins is talking to another man just now. Perhaps you would like to look at this while you wait."

He handed young Parker a booklet describing the apprenticeship courses established in the plant. Les had barely time to notice that the booklet was generously illustrated, similar to the catalogue of a prep school he had seen at the home of one of his more affluent young friends. Then the door marked "Mr. Jenkins" opened and a young man came out and left the building and the clerk nodded to Les to enter.

The first thing that struck Leslie was that Mr. Jenkins rose and shook hands with him just like the officers in the front of his father's bank rose and shook hands with important looking elderly gentlemen who came in. This was a new experience for Leslie and he enjoyed it much. It was the first time in his life that he had been

treated otherwise than as a boy. This man evidently took him seriously.

Mr. Jenkins was just as neatly dressed and just as careful in his manner and speech as any of the bankers. His office was clean and orderly! there was none of the mess of things thrown together which even Les had learned to associate with offices in shop departments of plants and factories.

He smiled when Les told him of his long and futile search for a satisfactory foundry apprenticeship.

We Need Young Foundrymen

"I am sure that we can give you just what you want," he said. "What you want is what we need. We must have young foundrymen of the best type to build up our organization. The only good way we know of to do this is to train them. You may be sure that the training we give is the best we can devise because in a few short years the entire business will depend upon these young foundrymen and if they have not been well trained the business will go to ruin. Our need is your protection."

"Have you got regular apprentice contracts with different branches of work all written into it and pay rate schedule printed and the dope on school attendance and all that?" Les asked him.

"We surely have; we wouldn't have a real apprenticeship if we did not have the contract."

Then he pulled open a drawer, took out a four page form and handed it to Les. It was the indenture or contract of a 3 year apprenticeship course for high school graduates. This was something Les had often read and heard about but had never seen. The first page contained the formal statement of the agreement, the length of the course, both in years and actual hours of work, and spaces for the names and signatures of the parties to the contract. On the second page were explanations of the details of the arrangement such as the requirements for school work, methods of instruction and supervision in the shop and the relations between the corporation and the apprentice and his parents, and between the apprentice and the officials in the shop. Work and pay schedules were on the third page. There was nothing on the last page except index marks for filing.

The work schedule interested Leslie the most and he studied it at some length while Mr. Jenkins looked on. It provided the following:

	Hours
Helping Molder	300
Bench Molding	600
Machine Molding	300
Miscellaneous Floor Work	200
Large Cores	600
Small Cores	600
Heat Treating, Annealing	600
Furnace	400
Green Sand Molding	1150
Dry Sand Molding	1000
Sweep Molding, Checking Castings, Chipping Room, Sand Testing, Laboratory, Special Work	1570
Total	7320

"Do you really follow that?" he asked Mr. Jenkins.

"We certainly do. That is, as nearly as we can. Of course, we can't follow it to the hour. Suppose one of the boys is making 30 molds of a certain pattern in green sand, one every day. If he completes his green sand time allotment when 27 molds are finished, it would not be reasonable to transfer him and break in another apprentice on the job for the sake of the three remaining molds. Some consideration must be given to the requirements of the work in the plant. But we are conscientious about that plan of work."

Leslie was impressed. After a few more questions and answers he asked to be hired and was delighted to find that an opening existed. Mr. Jenkins wrote his name, address, telephone number, age, high school attended and other data on a card and then told him to return on the following day and bring a recommendation from his high school principal. He also said that he would like it if his father came along to see the plant.

Secures Recommendations

Next morning young Parker went to the high school and secured a fine letter of recommendation from the principal. Armed with this he returned to the Jamieson foundry in the afternoon and sought out Mr. Jenkins. His father could not leave his work so he came alone.

Apprentices are usually young, usually they have just come from school; they still expect personal attention and direction. In many foundries apprentices are hired, told to report to "Mr. Billings in building No. eight" and are then turned out to find building No. 8 and Mr. Billings as best they can by themselves. This sort of things does not help their enthusiasm. The situation becomes worse if Mr. Billings receives them with a grunt and puts them to work like he would a seasoned old foundry laborer. By way of contrast, observe how they handled Leslie Parker when he began work at the Jamieson Foundry Co.

In Mr. Jenkins' office a record form was made out for him and he was told that his contract would not be granted until he had completed a probationary period of 3 months. Then Mr. Jenkins gave him a clock number and card and told him where to punch it and he became officially a member of the organization.

They then crossed the yard, entered the foundry and walked through the dry sand floor where Mr. Jenkins nodded to many apprentices and to others as well. Near the center of the shop they came to the small, glass enclosed office of the shop apprentice instructor. This tall, rangy, rather solemn looking individual was introduced to Leslie who could not immediately make up his mind whether he would like him or not. He was quite as courteous as Mr. Jenkins but his demeanor was stern in comparison. Jenkins merely explained that Les was "the young man we talked about yesterday," and then left him with the instructor.

"Come on and I'll show you everything so you can get started right in the morning," the instructor directed. "First let's go to the locker room where you'll keep your clothes."

A short walk brought them to a low platform leading to a large swinging door beyond which they found two long rows of wash basins and four long rows of lockers. An old sweeper in charge of the room gave Les a number and a key to one of the lockers for which he signed a receipt card.

A longer walk brought them to a window of the store room where the instructor introduced the new apprentice to "Charley," a short, curly headed, silent man who ruled there.

"This is where you come in the morning for your riddle, rammer and air line," explained the instructor, "And for gaggers, rods, chills, nails and other supplies whenever you need them. To get supplies from here you must have an order from your foreman or from me, usually from the foreman."

They next visited the core room where, the instructor told him, he would start the following morning, making small cores on the bench. The foreman of the core room was quite young, Les thought, not much older than himself.

Ready for Work

"He'll be your boss as long as you are in this department," the instructor explained. "He'll tell you what to do and how it should be done. If you get stuck with your work, call me or the boss will call me and I'll stay with you until you are on the right track. In general, the boss will tell you what results he wants and if necessary, I'll tell you how to get them. I'll be waiting for you here in the morning to show you how to get started."

Before he went home that afternoon Les went back to the employment office and Mr. Jenkins took him to the hospital and explained the function of this department in case of accident or illness.

On the following morning he derived much comfort from the fact that he had worked in a foundry before and that his overalls looked worn and suggested experience. It would have been embarassing indeed to appear in a pair of shining, new, stiff overalls with the original starch still in them. He went through all the

necessary motions and felt initiated from the start.

In the core room he found the instructor at one of the benches, bending short lengths of wire. There was a small pile of sand on the bench under a hopper above, as well as a core box, rammer, slick, trowel and other equipment.

"Good morning. Have you ever made cores before?" the instructor began bluntly enough.

"No sir, I haven't; all I did was to help the molder."

"Well, no matter. You'll soon be on to this."

It was not yet starting time and a number of coremakers were standing about watching the instructor who proceeded to show young Parker how to make the cores.

"You throw sand into the box like this about half full," he explained, suiting action to the word. "Then you lay one of the wires into the sand to strengthen the core, much like the rods in reinforced concrete. Pile the sand up now and tuck into this corner and into the other one. Ram up tight with the rammer and then strike off with the straight edge. Get the plate and flop the thing over suddenly. If you don't do it quickly the sand will drop out. Then you lift off the box and take the plate to the oven tray behind you for drying and then you're ready to make another core. Now you try one."

At this point the whistle blew and to Les' relief the men went to work at their various stations. He found it quite easy until he was ready to tip the core out when he hesitated an instant while the box was suspended over the plate and the sand dropped out. The instructor smiled at this and Les could not help laughing.

Makes Cores in Quantities

Leslie damaged the second core by failing to lift the box straight up and the instructor showed him how to patch it up with his slick. Further attempts were more successful but the instructor remained until he was turning cores out at a satisfactory rate. Then he left to help another apprentice in the department with some problem or other. He soon returned bringing an order sheet calling for 2000 cores and a time card for the job, both of which he left with Les.

The morning passed quickly enough and while Leslie ate his lunch a number of apprentices came to compare notes. His manner suggested ability to take care of himself and there was no attempt to haze or torment him as a newcomer. He learned from them that most of the apprentices were regular fellows but a few *didn't rate*, that the apprentices had a football team that hadn't been defeated, that you couldn't put anything over on the instructor, that they had an apprentice club which put on dances, picnics and parties, that the core room foreman was easy going, that Jenkins was a good sort, that many of the foremen were apprentice graduates and pretty good fellows, that the general foreman was tough and got after anyone he found coming in late or in the locker room during work hours, and much more of a like nature. In turn, they plied him with questions about himself and secured a satisfactory amount of information.

And so Leslie worked himself into the organization. He soon learned to share the respect of the other apprentices for the instructor and as the months passed he depended on him more and more. He was always on the job, always ready to help and always took his work seriously. He was the dominating factor in the success of the training program.

It is needless to say that Les and his parents were well satisfied with his job. He was happier now than he had been at any time since the selection of an occupation had first loomed as a really serious problem while he was still a student. His relations with the foreman, the other apprentices, the workmen, the instructor and the supervisor were as pleasant as could be.

Wonders About Schedule

One thing, however, still remained on his mind in spite of the favorable circumstances and before this was settled he could not feel perfectly secure. He did not yet know how carefully the work schedule would be carried out. He knew from experience that in this matter the promises of the employers and their execution could be entirely different.

His work program prescribed 600 hours of bench work in the core room and he was curious to know if he would be transferred when he should be or if he would need to complain. When 550 hours were completed the clerk of the apprentice office came along one day with a pad and pencil and took Les' time card from the rack and copied figures from it. Then he stood for a moment making calculations and went on without even speaking to Leslie. Within a day or two Mr. Jenkins, the supervisor, spent 20 minutes talking to the foreman of the core room. A week later the foreman told Les to go to the apprentice office a short time before the noon hour and when the time came he cleaned up a little and went up as directed.

"Oh, hello," Jenkins greeted him. "I suppose you are wondering if you will be transferred to a new department in time."

"I did think about it a little."

"Only a little?" the supervisor asked with a knowing smile.

"Maybe I thought about it a lot," Les agreed, laughing.

"I'm sure you did. Anyhow, next Monday morning, instead of going to the core room, you report to the special training floor; you know where it is, next to the sand plant. The instructor will be there to break you in on a molding job of your own. We think that you have had enough helping experience, you have shown some ability, and you should be able to start molding without difficulty. Be sure to thank the foreman of the core room for his care of you when you leave Saturday noon.

Everything Is Satisfactory

"Now tell me, have you found everything about your apprenticeship just as you thought it should be?"

"Yes, I have."

"Well, if you ever find anything wrong, if you ever develop a complaint or a grievance, be sure to come in and tell me about it. If we can, we shall fix it up for you or if we can't straighten it out we may at least be able to show you that the difficulty cannot be prevented. In any case, a situation of that kind is always relieved by talking about it and a grievance always becomes worse if you keep it to yourself. Don't forget that our business here is to help you through this apprentice course to the greatest advantage for yourself and the corporation."

On Monday morning, accordingly, Les went to the designated department and found the instructor waiting for him with a glistening red and black pattern, floor boards, flask sections, riddles, rammer, head blocks, air line, clamps and other paraphernalia necessary for an ordinary floor molding job. In teaching Les how to mold, the instructor was as thorough as he had been the first morning in the core room. This task was much more difficult and the instructor stayed with Les practically all of the first day and much of the second before he could get along well enough by himself.

We could continue to tell about the progress of this apprentice through his three year course but this is not necessary. It was our purpose to point out that the Jamieson Foundry Co. was able to interest Les Parker and other young men of high caliber in spite of the popular opinion that the best young men will not work in foundries. The reason was that the Jamieson apprenticeship was the genuine thing and not a farce. In the first place, applicants were courteously received. Then they were given a carefully planned program of work and this program was carried out by officials in direct charge of the work, and by all members of the organization who felt their importance as factor in the enterprise.

The events here related occurred in the autumn of 1928. Les Parker has now completed 2 out of the 3 years of his apprenticeship. At the pres-

ent moment his progress is held up by short hours but before the end of 1931 he will be graduated from the course. In the meantime he has made a favorable impression and the superintendent and Mr. Jenkins are planning a night course in metallurgy for him in the hope that he may qualify for a responsible position.

Ohio Group Meets in Cleveland

APPROXIMATELY 50 members of the Ohio Foundries Association Inc. attended a regional meeting at the Cleveland Athletic club, May 22. The meeting was held under the chairmanship of A. H. Kramer, Advance Foundry Co., Dayton, O. After a few remarks by Mr. Kramer in opening the meeting, B. R. Pearse, Atlas Foundry Co., Cleveland, suggested the formation of a local group of the association. Mr. Kramer and Ralph West Sr., West Steel Casting Co., Cleveland, expressed opinions in favor of the idea. Leroy P. Robinson, Werner G. Smith Co., Cleveland, was appointed chairman of a committee to undertake the formation of the group.

Mr. Kramer then called on Arthur J. Tuscany, manager, Gray Iron institute, Cleveland, who stressed the need for co-operation among foundrymen and said that such an attitude would give a great deal of satisfaction.

The meeting was addressed by E. L. Shaner, editor, *Steel*, Cleveland, on "What Would Influence a Better Price Level," and by D. B. Reader, Electro Metallurgical Sales Corp., New York, on "Alloys and Their Effects in Iron and Steel, with Particular Regard to Those Used as Scavenging Agents." Mr. Shaner traced the price movements from 1850 to the present, saying that from 1850 to 1873 prices increased, from 1874 to 1896 they declined, from 1896 to 1914 a rise took place and from 1914 to 1920 prices kept on rising due to war activities. During 1920 and 1921, there was a recession because of post war conditions, and from that time until 1929, with the exception of 1924, there was a continual rising. Price variations prior to the war were due to the fact that the price of commodities was controlled by the cash and credit available. Since that time, conditions have changed. One reason that has influenced price structure since that time is the concentration of gold in France and the United States, which has taken the money from many countries where it is needed for supplies of various kinds. Another is the impetus that has been given to production activities.

According to Mr. Shaner, the one thing that will influence a better price level is the return of confidence with the firm belief that every bit of inflation has disappeared. He read several statements from a broadcast by Ford, Bacon & Davis Inc., New York, engineers, which in his opinion, if followed, would hasten the return of normal times and a better price level. The factors included: Take things as you find them today; assume that this is what you are going to have for some time to come; cut out hoping and get to work; at once reshape your business to meet these conditions; cut your costs so they meet today's prices and yet make a profit; discard every obsolete method in your plant; don't replace any machine with one like it, it's out of date; write down your inventories at once; and get out of decadent lines and minds.

Many executives have made various readjustments and have put off anything drastic as the last resort. They now are convinced that the time has come for such readjustments. The subject of wages is an important problem, the speaker said, and that probably the best method of reduction, if reductions are necessary, is in the following order: First, cut common dividends; second, reduce salaried employes; and as a final resort, cut wages. The speaker was of the opinion that such a method is the most logical for attacking the problem and the one fairest to all concerned. He stated one trade association has studied cost cutting methods by sending out questionnaires to its members on the methods adopted to solve that problem. This resulted in the discovery of over 60 methods of reduction.

Earl L. Shaner

The second speaker, D. B. Reader, replaced R. C. Good, metallurgical engineer, Electro-Metallurgical Sales Corp., who was unable to attend the meeting. In discussing manganese and silicon and their effects the speaker gave their various combining forms and explained the use of silicon briquets. That element also is a graphitizing agent in gray iron and copper-manganese and zirconium silicide play the same role. Other alloys were mentioned, especially those of a complex nature which may be used to advantage under certain conditions. Control of the metal at the time of additions is important to secure greatest effect of the desirable reactions and to reclaim the maximum proportion of the desired elements.

The speaker then described the action of aluminum, calcium, manganese, titanium, sulphur, vanadium and zirconium as deoxidizing and degasifying agents. He discussed basic and acid electric furnace practice for the production of steel castings and outlined the desirable furnace practices. He stressed the necessity of inclusion elimination as a method of producing high quality steel. In discussing additions for the elimination of atmospheric oxidation, he mentioned aluminum-silicon, calcium silicide, calcium-manganese silicide and calcium-aluminum silicide. Those were added to the metal with the idea of forming relatively large inclusions which will float to the slag easily instead of allowing the formation of small or even submicroscopic inclusions which were practically imposible of elimination.

Following the two talks, the meeting took up the discusion of the new code covering the specific safety requirements for operation of and conditions in foundries. B. R. Pearse, Atlas Foundry Co., Cleveland; A. H. Kramer, Advance Casting Co., Dayton, O.; Ralph West Sr., West Steel Casting Co., Cleveland; J. H. Bruce, Bowler Foundry Co., Cleveland, and B. D. Fuller, Whitehead Bros. Co., Cleveland, took part in the discussion.

Officers Are Nominated

The nominating committee of the American Society for Testing Materials has nominated the following: President, F. O. Clements, technical director, research laboratories, General Motors Corp., Detroit; vice president, S. T. Wagner, consulting engineer, Reading Co., Philadelphia; members of the executive committee, A. W. Carpenter, manager of testing laboratories, B. F. Goodrich Co., Akron, O., K. B. Cook, technical manager, Manville Jenckes Co., Pawtucket, R. I., G. C. D. Lenth, consulting engineer and secretary, Clay Products association, Chicago, O. L. Moore, engineer of tests, Universal Atlas Cement Co., Chicago, and J. B. Johnson, chief, material section, air corps, U. S. A., Wright field, Dayton, O.

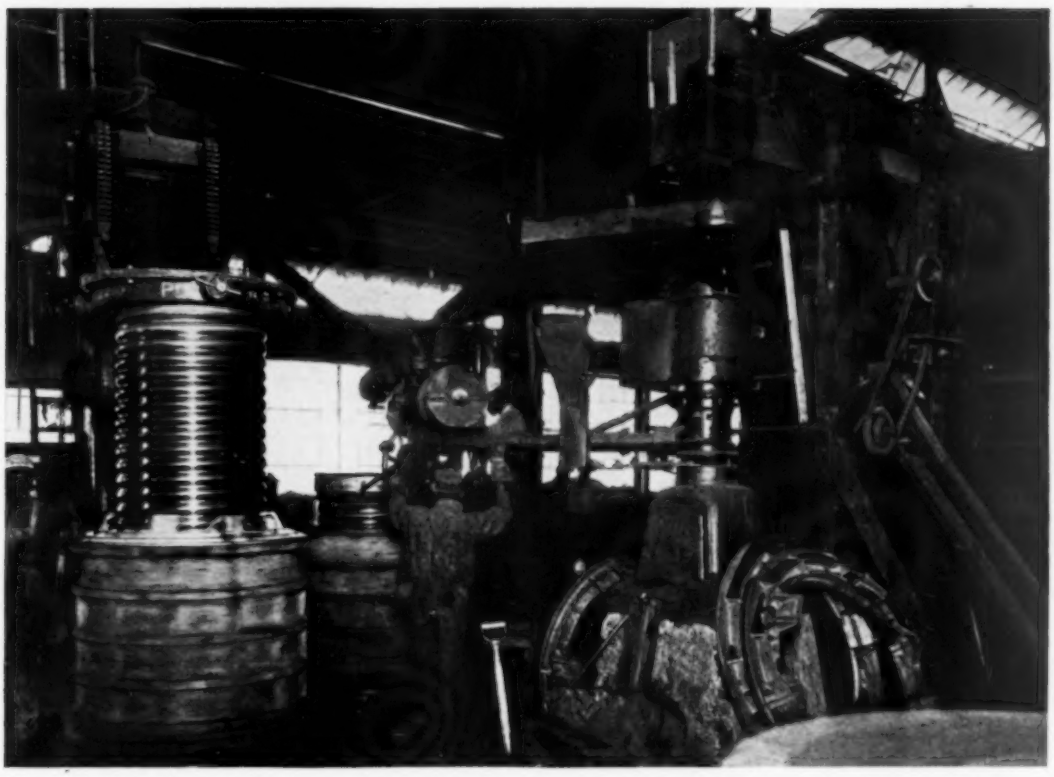


Fig. 1—The Pattern Is Removed Vertically From the Revolving Mold After the Manner of Separating a Bolt and Nut. One Sand Slinging Machine Serves Two Revolving Stations

Corrugated Pipe Pattern Forms Mold and Core

By Pat Dwyer

THE plant of the American Castings Co., Birmingham, Ala., is devoted exclusively to the production of cast iron culvert pipe in two standard designs, lock joint and spiral, in diameters from 10 to 36 inches and in standard lengths of 3 feet. Each casting is 39 inches in length, but on account of the lap at each end, when two sections are joined, the length of each pipe laid in position is 36 inches. The thickness of metal varies from ⅜ to ½-inch depending on the diameter of the pipe. At one time the castings were made in 4-foot lengths, but a wide spread demand from the customers for a lighter and more readily handled section induced the manufacurer to reduce the pipe from 4 to 3 feet.

Great numbers of these castings are destined for use under new roads and in areas difficult of access, far from railroads and settled communities, hence the reduction to a size and weight within the primitive facilities available for handling them. It is claimed also, the shorter lengths afford greater flexibility in the field, before, during and after laying. The many jointed pipe adjusts itself readily to any subsequent distortion in the trench. Incidentally it may be noted that in shipping the pipes by rail, from the plant, small diameter pipes are packed inside those of larger diameter with a consequent material reduction in the number of cars required for a given weight. The normal daily output of the plant is 120 tons.

Lock joint pipe as the name indicates, is a modified bell and spigot type. The usual bead on the spigot end is replaced by two small projections, located opposite each other. The short bell end also contains two interior projections. In service the spigot end of one pipe section is inserted in the bell end of a second pipe section. The first section of pipe then is given a quarter turn which brings the projections on the spigot end behind the corresponding projections on the bell end and locks the two sections together. The projections are slightly wedge shaped and as a result the farther the pipe is turned the tighter the two parts are locked together.

Corrugated spiral pipe of uniform thickness is made up of a continuous spiral with a 4-inch pitch. In service the end of one section enters the end of a second section in the same manner that a bolt enters a nut. Under ordinary conditions a partial turn is sufficient to lock two adjoining pipe sections, but when occasion arises, one part may be turned into the other any distance up to the entire length. This feature eliminates the necessity

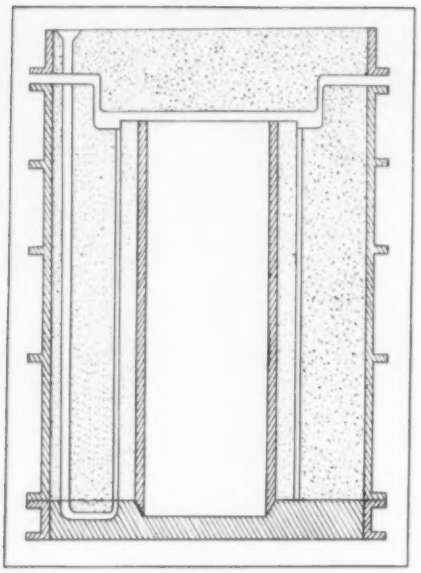


Fig. 2—Straight Sections Are Poured Through a Gate in the Bottom

of cutting sections in the field where the assembled pipe must conform to a definite length. For example five 3-foot sections may be compressed to fit a 14-foot culvert.

D. B. Dimick, Sr., president of the American Castings Co., invented both types of culvert pipe and then built the present plant and equipped it for the production of these castings in quantity. For the past few years D. B. Dimick Jr., has been associated with his father as general superintendent in charge of plant activities.

Originally designed as a plant in which the sand in the molds was to be rammed by hand, the building 120 x 600 feet is divided into three longitudinal bays, one in the center 60 feet wide and two 30 feet wide, one on each side. Molds at first were made, poured and shaken out in all three bays. Changes in layout and methods have been introduced from time to time and it is possible that further modifications will be in effect before this description is published.

Some of the molds in the two outer bays are rammed by hand, but the great bulk of the molds are prepared in the center bay and then carried into the north bay where pouring is carried on continuously all day. After each batch of molds is poured it is taken back to the center bay and shaken out. A transfer car carries the molds from one bay to another. The shop is unusually well provided with electric traveling cranes made by the Harnischfeger Corp., Milwaukee. Four of these cranes serve the center bay, two are located in the south bay while the north bay, in which the cupolas are located, is spanned by three. It is claimed that on account of the great number of flasks and the number of times each one has to be handled in whole or in part, each crane makes an average of 2000 lifts per day.

Outside the molds that are rammed by hand, all the molds are divided into two main groups, those that are formed on jolt machines and those

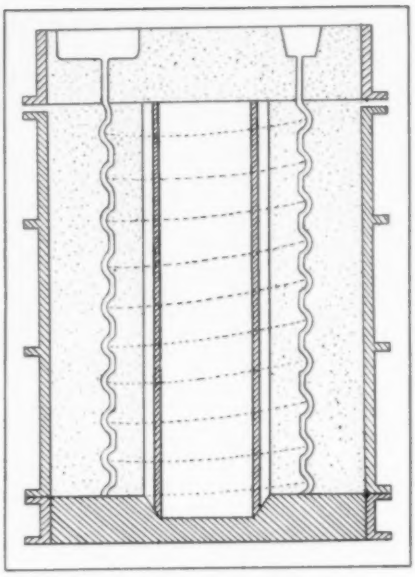


Fig. 3—Corrugated Sections Are Poured Through Gates on the Top

that are made on revolving tables and in which the sand is packed in the flasks by machines supplied by the Beardsley & Piper Co., Chicago. The first group is confined to the lock type pipe. The second group includes all sizes of the spiral corrugated pipe. The methods and equipment employed in both instances are alike to the extent that mold and core are formed simultaneously inside an iron flask and around an iron arbor, but there the resemblance ceases. The lock joint pipe pattern is plain and simple and

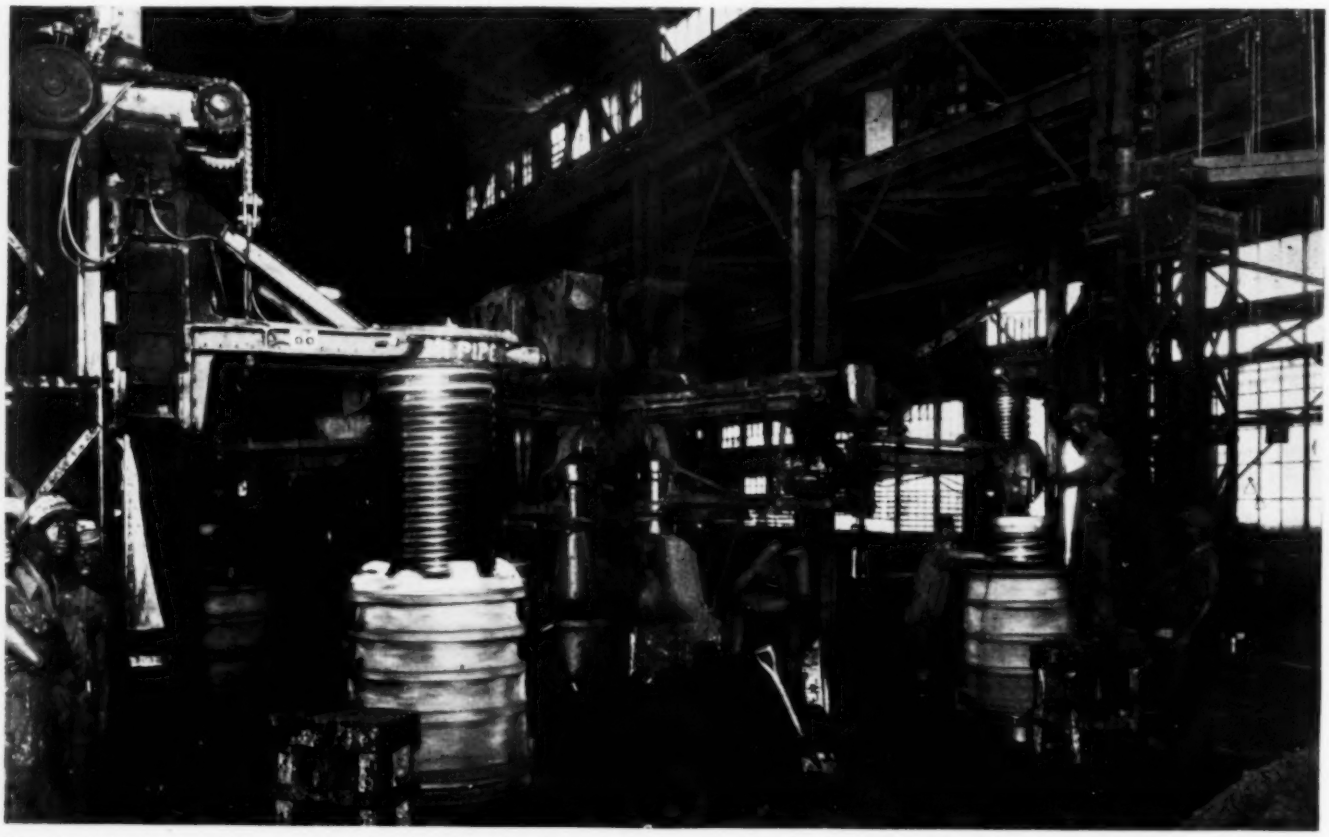


Fig. 4—A Pair of Stationary Sand Slinging Machines Are Served by a Twin Sand Conditioning and Conveyor System. Condition of the Sand Is a Highly Important Feature

requires no special equipment for its extraction. The spiral type of pipe pattern presents many peculiarly difficult features when regarded from a molding view point. The method and equipment developed for molding these pipes reflect a high degree of ingenuity and mechanical skill, also a comprehensive knowledge of several basic foundry principle. A sectional view of the lock joint and spiral types of pipe, slightly exaggerated in some features for clarity of presentation, is shown in Figs. 2 and 3 respectively.

An idea of the actual shape and size of one of these spiral patterns may be secured from the photographic reproduction in Figs. 1 and 4. The pattern is cast as a plain cast iron cylinder and afterward machined inside and outside to the desired shape. Manifestly the nicest accuracy of finish is required in a pattern that is extracted from the mold in the same manner that a bolt is extracted from a nut. In fact the conditions are even more exacting. A bolt is threaded on the outside and this thread moves in a suitable channel provided for the purpose in the nut. The spiral on the pipe pattern travels in a groove in the mold on the outside and at the same time the hollow spiral on the inside moves over a spiral body of sand formed on the face of the core. When the pattern is extracted the mold and core stand in the proper relative position to each other and separated by the proper distance to impart the desired thickness to the casting. Neither mold nor core are moved away from each other during the molding process and as a result the mold cavity is not subjected to possible change.

The installation on which the pipes are molded is made up of two units located side by side near the center of the main bay of the foundry. Each unit includes a stationary type sand slinging machine made by the Beardsley & Piper Co., Chicago, two revolving tables on which the molds are prepared and two hoisting devices for drawing the patterns. A twin sand storage bin supplies both machines and is replenished from time to time by a grab bucket suspended from one of the cranes. Sand from the bottom of the bin passes over a screen and magnetic separator before it enters the sand slinging machine.

A great deal of intensive experimental work was involved in setting a standard for the sand employed on this job. It has to be rammed hard to prevent the casting from swelling around the bottom. It has to be highly permeable to permit the rapid escape of steam from the fluted surfaces and to counteract the slicking effect of the pattern on these same surfaces as it is extracted from the mold.

The sand is submitted to a severe test in the majority of the molds in which the molten metal enters the top through a number of small, shallow gates. Part of the metal follows the spiral of the mold and core, but the remainder drops almost vertically and naturally hops from shelf to shelf during the descent. In the largest molds the metal is carried to the bottom in two vertical sprues each of which discharges through a core into a number of small gates on the bottom edge of the mold. The ensemble in effect is a species of horn gate with many outlets instead of the usual single outlet. The same method is employed on some of the lock joint sections and is illustrated in Fig. 2. The bottom gate core also may be seen in Fig. 6.

Fig. 5—The Molds Are Set Up in a Long Row for Convenience in Pouring

In common with the equipment in foundries devoted to the production of pipe in all shapes and sizes, the flasks in which the spiral pipe are made, are exceptionally substantial. This also applies to the core arbors. The flasks are reinforced by exterior ribs and flanges and the arbors are reinforced by vertical ribs. Typical examples of flasks and arbors are shown in Figs. 5 and 6 respectively. The vertical ribs on the arbor help to support the sand forming the core. This sand is subjected to a severe torsional strain during the extraction of the pipe pattern, particularly at the beginning of the operation when adhesion between sand and pattern is greater than at any other time.

To insure proper setting of flasks, arbors, and patterns, the contact surfaces of the various parts are machined accurately. The bottom flange on the drag sits in a suitable depression in the face of the revolving table. This table is mounted a few inches above the floor level. It resembles the table on an ordinary boring mill and is motor driven from underneath. The arbor is machined on the lower end to fit in a recess in the iron plate which forms the face of the drag. The lower edge of the pipe pattern also is located definitely on this face plate.

With the various parts in position, the table is set in motion and a stream of sand is driven into the space between the flask and the pattern. Also into the space between the pattern and the arbor. When the flask is filled to the top, the superfluous sand is struck off flush with the upper face of the flask and an aluminum guide ring is clamped in place to steady the pattern and to hold the feather edge of sand on the top of the mold and core, in place.

Four guide points on the interior of the aluminum ring are lined with babbitt in a jig conforming to the spiral on the pattern. These babbitted areas hug the pattern closely and insure a steady and accurate draw. On

Fig. 6—A Cast Iron Arbor Ribbed and Vented Supports the Core

account of the extreme accuracy required, each of these rings is relined at the close of the second day's operation, which means that the pattern has been drawn through it approximately 200 times. The output of each molding unit is approximately 200 molds per day, 100 from each revolving table. The long arm of the sand slinging machine can be swung to deliver sand to either one and in practice, the tables are utilized in rotation.

Thus while the operators are adjusting the ring and removing the pattern from one mold, a second gang is working over the other. In this manner the entire equipment is kept in continuous operation.

Synchronized With Table Movement

When the flask is filled with sand the table is stopped until the guide ring is adjusted and the pattern drawing apparatus has been attached to the pattern. A front view of this device is shown in Fig 1 at the left and a side view, which perhaps is more explanatory, is shown in the same position in Fig. 4. The device is operated by a hand crank and is synchronized to move with the revolving table. Its principal object is to support the weight of the pattern as it is ejected upward from the mold. When the table begins to revolve and the pattern is held stationary, it is apparent that the spiral construction will force the pattern upward.

After the pattern emerges it is swung through a short arc of a circle and lowered into position on the second revolving table where the process described in the foregoing paragraphs, is repeated. In the event that orders for two different size pipes are going through simultaneously, the pattern is dropped back on the table from which it just has been lifted. The entire unit is flexible to quite a degree and can be adapted to long running, or short broken orders.

Copes for all these molds are rammed on a plain jolt machine. The runner basin is formed at the same time the cope is rammed and as a result the molds are assembled quickly and easily. They are shaken out just as readily. After the casting has set the cope and drag are removed. Then the assembly containing the cheek, arbor, casting and sand, is lowered by the crane on top of an iron cone set up on the floor for the purpose. The arbor is tapered slightly with the large end up. The cone engages the arbor on the bottom and when the crane slacks off on the cheek, that part of the mold sinks while the arbor is forced upward. This action frees the sand and when the strain again is taken on the crane chain, the cheek comes away, leaving arbor, flask and sand sprawled around the cone. Arbor and casting then are taken to their respective destinations and the sand is wet down and the process is repeated.

Metal is melted in two cupolas, one 48 inches diameter inside the lining the second cupola, 66 inches diameter inside the lining.

Chill molds set against the pattern on the inside, form the projections on the small or spigot end of the lock joint type of pipe. The cast iron arbor supporting the main core only extends upward to the bottom of the bell as shown in Fig. 2. Sand in the cheek is flush with the upper edge of the pattern and the upper edge of the flask. On the inside it is cut off flush with the top of the arbor and the upper face of the bell pattern. The cope is made on a small jolt machine with the lower projecting part supported by a plate. When the cope is placed upon the drag, this suspended part rests on the top of the arbor.

The lugs which form the locking device in the bell end are formed by projections on the ends of levers that move laterally. They project into the sand during the ramming operation. Afterward they are pulled back out of the way before the cope is lifted from the table.

Management Course Is Offered at Carnegie

Carnegie Institute of Technology, Pittsburgh, is offering two courses in works management, one of which is of especial interest to foundrymen. The two-year course is offered especially for training in foundry management and consists of study in basic subjects such as metallurgical calculations, chemical analysis, strength of materials, furnace practice, shop courses in foundry, pattern shop and machine work, accounting, cost systems, estimating, cupola, electrical furnace and crucible melting, etc. Inspection trips to foundries in the Pittsburgh district to study foundry methods also are included.

Four years of high school work are required for eligibility as well as the passing of entrance examinations. Men who have not completed high school but who have practical experience and can pass the entrance examinations also are eligible. Examinations will be held at Carnegie Institute of Technology in September. A formal certificate is presented to those satisfactorily completing the course.

The four-year course covers the usual engineering subjects as well as those necessary for a thorough understanding of works management. At the completion of the course, a degree of bachelor of science in works management is conferred. Cost is practically the same for both courses; $850 per year for those living at the university and $300 for those residing in the Pittsburgh district. Books and supplies cost approximately an additional $40.

Companies Consolidate

Arrangements have been completed for the consolidation of the International Derrick & Equipment Co. and the Stacey Engineering Co. both of Columbus, O. The new company, to be called the International-Stacey Corp., will have assets in excess of $10,000,000.

Col. Carmi A. Thompson, Cleveland, will be chairman of the new company and Harry M. Runkle, Columbus, will be president. Stockholders of both companies have approved the merger. Offices will be consolidated in Columbus.

The International Derrick & Equipment Co. is one of the largest companies in the country engaged in the manufacture of oil well equipment, towers, derricks, transmission, power lines and railroad equipment, standard buildings, bill boards and other standardized products. It owns and operates plants in Columbus, O., Delaware, O., Beaumont, Tex., and Los Angeles. It maintains 30 warehouses in this and foreign countries.

The Stacey Engineering Co. is owned and operated by the Stacey Bros. Gas Construction Co. and is largely interested in the Stacey Mfg. Co., both of Cincinnati. It owns and operates two plants at Connersville, Ind., the Connersville Blower Co. and the P. H. & F. M. Roots Co., as well as the Wilbraham-Green Blower Co., at Pottstown, Pa.

Celebrates Appointment

A testimonial dinner was given at the Hotel Stratfield, Bridgeport, Conn., May 7, in honor of Edward C. Bullard to mark the occasion of his appointment as vice president and general manager of the Bullard Co. to succeed his uncle, the late Stanley Hale Bullard.

Remarks were made by E. P. Bullard president of the company, Mayor Buckingham, of Bridgeport and others prominent in civic and industrial affairs in Bridgeport. A feature of the evening was a special honor table at which were seated the Old Timers of the Bullard organization. Twenty-three men comprising this group, represented a total of 73 years an average of 32 years each. The new vice president and general manager was presented with a set of golf clubs and a miniature model of an automatic machine made by the company.

Opens New Office

C. F. Herington, for the past 9 years in charge of erection, sales and engineering for pulverized coal plants for Heyl & Patterson Inc., Pittsburgh, has opened an office at 1440 Broadway, New York. Mr. Herington has specialized in the design and erection of pulverized coal plants for the past 15 years. He will continue in that line at his new location.

Questions & Answers on FOUNDRY PRACTICE

GENERAL

Facing Mixture Varies

Have you any information on what amount of seacoal will be suitable for facing for gray iron condulets weighing from ½ to 5 pounds each?

The amount of seacoal used in sand facings depends to a large extent upon the quantities of old and new molding sand used in the facing mixture. The larger the quantity of new sand, the greater the amount of seacoal will have to be used. We believe that a ratio of 1 part of seacoal to 12 parts of facing sand composed of 2 parts of old sand and 1 part of new sand, will be satisfactory for the castings mentioned.

Q & A

Make Sash Weight Rig

Where can we secure information on the most economical method of making sash weights. We are not so much interested in the metal as in the molding method.

Sash weights are made according to a variety of methods depending principally on the volume of business. In comparatively small quantities they are made extensively from solid patterns sunk half way in a follow board. The sand is rammed by hand. Where a squeeze or jolt machine is available, the patterns are mounted on match plates. Wood patterns are fairly satisfactory, but metal patterns are preferable for long, hard usage. In several plants the patterns are mounted vertically on jolt machines. The metal patterns are stripped through a plate and the eye in each is formed by a small core. The length of the casting is determined by the distance the pattern is allowed to project above the plate.

In another method also practiced extensively, two rows of patterns (steel pipe) are rammed alternately above each other horizontally in a deep flask and are pulled out through suitable openings in one end of the flask. The open ends are stopped by small cores or chills to form the eyes. The metal enters the terraced rows of molds through small gates at the opposite end. A comprehensive series of seven articles on the subject of sash weight molding appeared in THE FOUNDRY March 15 to June 15, 1924.

We suggest you get in touch with several molding machine manufacturers whose addresses may be found in the advertising section of THE FOUNDRY. Outline your anticipated production and they will be glad to submit estimates on patterns, equipment and methods.

THIS department covers all problems relating to metallurgical, melting and molding practice encountered in making steel, malleable-iron and gray-iron castings. Questions submitted by bonafide subscribers to this department will be answered by members of the editorial staff of The Foundry, supplemented where occasion requires by the advisory staff whose personnel is as follows:

John H. Hall
Cast Steel

H. A. Schwartz
Malleable Cast Iron

J. W. Bolton
Gray Cast Iron

All questions must be addressed to the Editor, The Foundry, Penton Building, Cleveland.

Q & A

Joins Bronze and Iron

We are endeavoring to secure data regarding the bonding of copper alloys with cast iron and steel. Can that be accomplished, and what method gives the best results?

If by bonding you mean a perfect or nearly perfect union of the copper alloy and iron or steel, we doubt that it can be accomplished by other than welding with an alloy such as tobin bronze. The latter has been employed successfully for welding sections of cast iron pipe together, and of course, it will unite with other copper alloys.

Bronze inserts are employed which are surrounded with gray iron, and bronze sleeves have been cast around steel shafts for certain purposes, but in both cases the bronze is held in place by mechanical means and not by a union of the metals. That is to say the bronze insert in the one case contains many projections which become imbedded in the iron which is poured around the insert. In the other, the steel shaft usually is scored and worn badly which leaves a rough surface. The bronze poured around the shaft fills the rough places more or less, and consequently holds tightly to the shaft.

If you contemplate casting bronze around gray iron, you must see that the iron casting contains projections which will extend into the bronze and cannot be loosened easily. Also the iron must be perfectly clean through sandblasting or other means. It should be heated, and placed in the mold while still hot. Then close the mold and pour the bronze without delay.

Q & A

Reduce Air Volume

My fan is too large for the reduced diameter cupola I now am operating and I want to know what is the proper number of revolutions to deliver 60,000 cubic feet of air to melt 2 tons per hour in a 25-inch diameter cupola. Under present conditions I do not want to install a smaller fan. The blast pipe is 10 inches in diameter and 12 feet in a straight line to the fan. Air enters the cupola through four tuyeres 4 x 8 inches.

So many variable factors affect the operation and output of a fan, we suggest you write the manufacturer for definite figures on the number of revolutions under your changed conditions. As a temporary measure, either

one of two other methods is available for cutting down on the volume of air entering the cupola. One is to partly close the opening through which the fan takes the air. The other is to insert a gate in the blast pipe. Of the two, the first is the simpler since it involves nothing more difficult than fitting a plate or a board over the opening. No actual figures can be presented to guide you in cutting the opening in the plate or board. In fact no figures are needed. The proposition is one for common sense based on observation and experience. A man fairly familiar with the operation of a cupola, can tell by the action whether it is getting too much or not enough air and then make his adjustments accordingly. You have to experiment a little over two or three heats to hit it exactly but thereafter no further adjustment will be necessary.

Q & A

Green Bond Needed

Can you give us any data on a core mixture for use with a core machine of the sausage type? The cores we have in mind are small square cores about ¼-inch square and 8 or 9 inches long. These cores must have sharp, square corners. We have been using bank sand and oil, but only obtain a ratio of 20 or 15 to 1. The sand seems to be full of clay. We are getting some sharp lake sand and would like to know the proportions of oil and sand to use.

It probably will be necessary to employ some type of binder such as flour or cereal binder to give a green bond strength to hold the core shape as it emerges from the machine. The fact that your present mixture gives good results as far a shape is concerned, may be due to the fact that it contains clay which gives green bond strength. However, clay will absorb a considerable quantity of oil without any benefit accruing. We suggest that you communicate with the maker of the core machine you have for suitable mixtures. However, you might try the following mixture: One hundred parts of sand and 12½ parts of flour. Mix well and add 1 part of linseed oil.

Q & A

Check Blast with Gate

For running off special heats of 20 tons, we are lining one of our 60-inch cupolas down to 46 inches. Will our present blowing equipment, fan, motor, piping etc., serve if we place a gate in the blast pipe to reduce the volume of air entering the cupola.

A blast gate in the pipe leading from the fan to the wind box will enable you to reduce the volume of air entering the cupola and in that manner you may utilize your present equipment. An alternative method of accomplishing the same purpose would be to reduce the size of the openings in the sides of the fan through which the air is drawn in. In still another method an opening might be arranged in the pipe to allow a certain amount of air to escape on its way to the cupola. The only drawback to any of these methods is that a waste of power is involved, since the motor will consume as much current as it did while serving the 60-inch cupola.

The melting capacity of a 46-inch cupola is only half that of one lined to 60 inches, approximately 7 tons per hour as compared to 14 tons, therefore only half the amount of air formerly required, will be needed under the new arrangement. If the change is only temporary the added expense may be justified, but if the cupola is to be operated permanently on a 46-inch lining, the installation of a smaller fan and motor is desirable. Based on the usual tuyere to cross sectional area ratio of 1 to 4, a total of 400 square inches will be needed for the new set of tuyeres. This may be represented by eight tuyeres 5 x 10 inches, by ten tuyeres 4 x 10 inches, or by six tuyeres 6 x 11 inches. The shape and size are not of major importance, so long as they are designed to admit the required volume of air freely. In this instance the volume of air will amount to 3500 cubic feet per minute.

GRAY IRON

Charge Borings in Cans

We are interested in the utilization of borings in our 32-inch cupola, but upon inquiry we find that charging cans are made in diameters of 5 and 7 inches and in 24-inch lengths. We hesitate to use a can of this length since it only leaves a margin of 4 inches at each end when charged horizontally in the center of the cupola.

If you only intend to use one can of borings in each charge you will experience no difficulty in placing a 24-inch can horizontally. If you are contemplating charges made up entirely of canned borings, the length of the can is too great. A 6-inch diameter can will hold approximately 100 pounds of borings. Therefore six of seven of these would be needed for the charge and that number of cans would occupy too great a space in the cupola and too much coke would be required to fill the great open spaces between the cans. On a 32-inch cupola you may find it necessary to flatten the can slightly so that it will not project above the remainder of the material comprising the iron charge.

Several other methods are available for charging borings in the cupola. In large foundries the borings are compressed into briquets approximately 3 x 4 inches. These briquets withstand rough usage without disintegrating. No binder is used in their preparation and they weigh approximately 80 per cent of a similar bulk of solid iron. In *Melting Iron in the Cupola*, by Hurst, a number of methods are described for the preparation and use of briquets in the cupola charge. An interesting description of how the local supply of tin cans was pressed into service as boring containers was presented by the late James M. Hollowell in the Dec. 15, 1923 issue of THE FOUNDRY.

Walter Prince who claims to have originated and patented the method of using borings in the cupola, while general foundry superintendent of the plants of the Worthington Pump & Machinery Corp., recommends stacking the cans in a single solid column in the center of the cupola. The usual charges of iron and coke are built around the central column as if it did not exist.

Q & A

Opposes Chill Molds

What size molds and what thickness of metal do you advise for the manufacture of 1-inch balls. What is the best type of gate and runner.

Chill molds are not favored for the manufacture of balls as small as 1-inch in diameter. It is claimed that any advantage of the chill method is not sufficient to compensate for the expense of making, operating and replacing the molds. So far as we know, all hard iron balls 1 inch in diameter and smaller are made in sand molds. Larger sizes are made in chill molds which have been described in THE FOUNDRY on several occasions. The molds are made in halves and mounted vertically. One half remains stationary while the other half is moved into and out of contact by a rod hydraulically operated. A short straight connection between the upright runner and each ball cavity has proved most satisfactory. Gates slanting either up or down are not as good as the plain horizontal gate. The gates and runner must be proportioned to the size and number of balls in a mold. A heavy gate and runner will produce shrink holes in castings, poured in an iron mold.

Q & A

Slag Is Spongy

We are operating a cupola lined to 60 inches which melts from 130 to 140 tons per 9-hour day. The iron charges weigh 4000 pounds composed of 50 per cent pig iron and 50 per cent scrap. The air pressure is about 10 ounces, and 80 pounds of limestone are used per charge. The other day we had trouble with spongy slag, and shut off the wind to punch the tuyeres. When that was done, slag poured into the tuyeres through the coke. The slag hole is open all the time, and slag had been flowing previous to the shutting off of the wind. The trouble occurred after the cupola had been in operation 7 hours. A good grade of byproduct coke is used.

We believe that a 4000-pound charge for a 60-inch cupola is too large. A 2000-

pound charge would be better, and the limit should be a 3000-pound charge. In operating a cupola continuously as you are, it is a good plan to clear out the slag deliberately several times during the heat. That is accomplished by plugging up the tapping hole, and allowing the iron to rise in the well until the slag practically is removed. Otherwise you may have a thin layer of iron on the bottom of the cupola with a heavy layer of slag on top, and difficulty will be encountered in handling the slag.

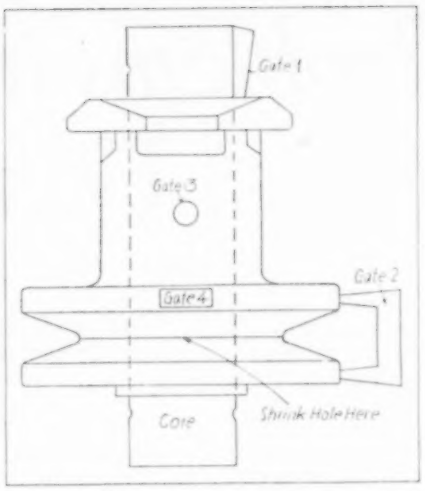
If the slag had been disposed of more fully during the earlier stages of the heat as described, you probably would not have had any trouble. It is necessary to keep a constant watch to see that the slag flows constantly, and that you do not let the iron drop down. When that occurs, the slag layer becomes deeper, and then when the iron rises, the slag is pushed up way beyond the slag hole. Spongy slag sometimes is formed when excess wind is used, but we believe that closer attention to regulating the flow of iron and slag will overcome your difficulties.

Q & A

Casting Has Shrinks

We are forwarding for your inspection a hub casting and several smaller castings which are causing trouble. Although poured from a soft iron, all castings have a hard skin. On smaller castings the edges, as you will note, are actually chilled to a depth of ⅛-inch or more. We have tried gating the hub alternately at both ends, as shown in the accompanying illustration, but with either method a shrinkage spot develops at the apex of the groove on the cope side. The iron mixture is made up of pig iron 500 pounds, good machinery scrap 400 pounds and steel scrap 100 pounds. The pig iron shows an anlysis: Silicon 3.08 per cent, sulphur 0.03 per cent, phosphorus 0.20 per cent and manganese 0.90 per cent. The iron in the castings analyzes as follows: Silicon 2.40 per cent, phosphorus 0.29 per cent, sulphur trace, manganese 0.51 per cent, combined carbon 0.24 per cent, graphitic carbon 3.20 per cent. The iron is melted in a 36-inch cupola on a bed 36 inches above the tuyeres and with 150-pound coke splits between the charges. The hub casting is molded in 10 x 16-inch flask, with a 4½-inch drag and a 4½-inch cope before squeezing.

The character of the shrinkage cavity indicates that it was caused by a combination of tight sand and a low head. The molding sand you employ is quite satisfactory, but in this instance where it forms a deep narrow groove in the casting, it must be vented with a wire to allow the extra steam to escape. Your flask is deep enough, but when the sand is squeezed down inside it for 1 or 1½ inches, you lose the effective sprue height required. Either place a frame around the top of the



The Casting May Be Gated At Any of the Points Indicated, 1, 2, 3 or 4

cope to raise the squeezed sand to the top of the cope, or, build the runner up with a green or dry sand pouring cup. The position of the gate is immaterial. A small pop gate ½-inch diameter on the center of the barrel, or a rectangular pop gate ¼ x 1-inch on top of the inner flange of the groove will introduce the metal just as satisfactorily as a gate at the joint and will require less metal to fill it.

Your bed and coke splits are a trifle high, but not excessive and are reflected in your melting speed of 7800 pounds per hour instead of between 10,000 and 11,000 pounds per hour which a 36-inch cupola should melt under ideal conditions. On account of the large coke burden you probably are using a blast that is heavier than necessary and in that way you are suffering a greater silicon loss than you imagine. The fact that your report shows "Sulphur not enough to analyze" leads us to doubt the accuracy of the remainder of the analysis. The low silicon content may be a contributory cause to the chilled edges, but the most probable cause is wet sand. Not wet in the sense that it is unfit for use, but too wet to lay against the side of a thin casting. Work the sand as dry as possible, vent the groove sand in the mold and raise the pouring head at least 4 inches above the top of the casting—the highest point—and you should have no further trouble.

Q & A

Presents Cupola Data

We are contemplating making and installing a 30-inch inside diameter cupola and would like to know if you have any information on the size of the windbox, tuyeres and blower.

According to Hurst's *Melting Iron in the Cupola*, a cupola with an inside diameter of 30 inches should measure about 10 feet 6 inches from the bottom plate to the charging door. It should have 6 tuyeres of the flaring type, that is to say, the opening in the cupola is larger than that in the shell. The tuyeres are rectangular and are 3¼ x 6¾ inches at the shell and 3¼ x 14¾ inches at the lining of the cupola. The windbox dimensions are given as 6½ x 36 inches with a 10-inch blast pipe opening. However, many cupolas of that size are equipped with 14-inch blast pipes.

A 30-inch cupola will melt from 3 to 5 tons per hour, and the blower should supply from 90,000 to 150,000 cubic feet of air, based on the usual ratio of 30,000 cubic feet of air per ton of iron. This will amount to 1500 to 2500 cubic feet of air per minute. While the figures given are based on a coke to iron ratio of 1 to 10, it is possible to reduce the amount of air used to 27,000 cubic feet per ton and in some instances as little as 24,000 cubic feet have been used successfully.

Before going ahead with designing your own cupola, it is suggested that you get in touch with cupola manufacturers who are listed in the advertising section of THE FOUNDRY.

MALLEABLE

Gives Contraction Data

Can excessive misruns in malleable iron castings be attributed to the use of facing sand? The facing sand is carefully prepared with the approximate ratio of 1 to 18. What will be the difference, if any, in contraction of two castings 24 inches overall with the same thickness of metal made from the same pattern in irons of the following compositions before annealing: (1)—Silicon, 0.90 per cent; total carbon, 2.80 per cent; phosphorus, 0.17 per cent; manganese, 0.28 per cent, and sulphur, 0.065 per cent, and (2)—Silicon, 0.80 per cent; total carbon, 2.95 per cent; phosphorus, 0.17 per cent; manganese, 0.30 per cent, and sulphur, 0.075 per cent.

Any condition which interferes with the escape of gases from a mold can produce misruns. Improper use of facing evidently comes under that classification.

Contraction as measured on hard iron, on unconstrained bars will be practically independent of composition but the net contraction from pattern size to malleable casting varies with the graphite content of the finished casting. The more graphite produced, the greater the expansion in anneal, and hence, the less the net shrinkage. The graphite content is the original total carbon minus the decarburization in anneal.

For ordinary annealing conditions the 2.95 per cent carbon iron will produce a casting 23.73 inches long; the 2.80 per cent carbon about 23.70 inches. If decarburization is heavy, the castings will be shorter. An originally white iron is assumed in these examples. Irons containing primary graphite grow in annealing.

Problems in Nonferrous Founding

By Charles Vickers

Iron Causes Trouble

We are casting door knobs in red brass and have considerable difficulty in machining them due to the presence of hard, crystalline inclusions which may be observed in the samples. We use a No. 00 Albany sand wetted down with molasses water. We have tried facing with new sand and molasses, skin-dried the mold and dusted it with silver-lead instead of flour, and have blacked the cores without success.

The hard, crystalline inclusions are caused by iron, and examination reveals that the impurity flows in with the metal, and lodges at or in the vicinity of the gate. It does not wash far from the place it lodges first which indicates that it floats on the metal. The iron is segregated, and probably exists as a sulphide. Therefore, you will have to observe how the iron gets into your metal. To eliminate the trouble, it will be necessary to prevent any iron entering the crucible. A flux of silica sand, lime, and soda ash with a little borax may be of assistance in removing the iron. Add enough sand so that the mixture is not to sticky or thick when molten. Add part of the flux with the copper, and part to the molten metal before it gets hot.

Q & A

Temperature Is Too Low

We are sending you a small brass casting which, according to the fracture, appears as though segregation had occurred. We melt in a pit-type, gas fired furnace, using a No. 50 crucible. We put small amount of glass in the bottom of the crucible, and use about 2 ounces of phosphor-copper as a deoxidizer. We have no pyrometer. Sometimes the metal melted down is all scrap, and at other times it is virgin metal. The segregation appears in both metals from time to time, but a perfect grain structure is obtained at other times.

Examination of the fracture of the sample forwarded us indicates that the metal is full of what usually is termed red oxide which is an indication that it has been poured at too low a temperature. Such cases usually go hand-in-hand with insufficient heat supplied during melting. The perfect grain structure which you obtain occurs when the metal is melted hot, and poured at the proper temperature. It is suggested that you purchase a pyrometer, and see that your pouring temperatures are correct for the types of casting in hand. The casting from which the specimen was taken should be poured at not less than 2150 degrees Fahr.

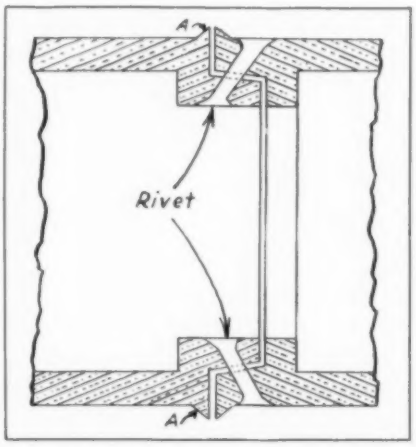
Q & A

Roman Joint Is Tight

What is meant by the term Roman joint?

In statuary casting the term Roman joint is applied to the peculiar form of joint adopted to join one part of the casting to another. The majority of large castings are molded in several sections which afterward are assembled. Manifestly, it is impossible to cast these various parts so that they will fit together without showing any joint. Since joints, however slight, would detract from the appearance of the finished object, the patterns are designed to conceal these joints and also to provide a means for anchoring the parts to each other.

An example of this type of joint is shown in the accompanying illustration. It was used by the early Romans and strange as it may seem, no better or more satisfactory type of joint ever has been developed. In fact statuary molding still is carried on substantially as it was in the days of the Roman empire when the art reached a high state of perfection.



The Ridge A Is Hammered Down and Filed Smooth after the Parts Are Riveted Together

Briefly it is a male and female joint with a slight ridge at the adjoining edges. After the parts are carefully fitted, two or more rivets are driven into place to hold them together. Then the ridges are hammered down. The soft metal flows readily and fills the crack. Excess metal is filed away and the result is an unbroken metal surface. When done skillfully it is impossible to detect the joint.

Q & A

May Use Inserts

One of our customers wants to use an aluminum pulley on a machine they are building, due to its light weight. The pulley is about 18 inches diameter, 3-inch face with arms and a double flange and the rim is heavier than ordinary pulleys. This pulley turns a few revolutions in one direction, then reverses and turns an equal number of revolutions in the other direction, and they are afraid the key way will not hold, but will chew and batter up.

The pulley will have to be so designed that the arms will not crack and pull away from the heavy rim, or the hub. As far as the key way is concerned a cast iron or steel insert can be cast in if there is any probability of the aluminum being too soft to stand up. If the location of the key way is well defined on the mold, the sides can be reinforced by steel plates anchored in the mold, one on each side of the key way, so that the jerk of reversal of the pulley will be absorbed by the steel and not by the aluminum.

In casting aluminum the important thing is to be careful and keep the temperature lower than a blood heat, instead of exceeding it, and pour the mold as cool as posible. As this pulley is no doubt quite heavy and is not a thin, small casting, the aluminum can be poured when it is quite silvery looking, instead of having a shade of red. An alloy of 92 per cent aluminum, 8 per cent copper, or one of 85 per cent aluminum; 3 per cent copper; 12 per cent zinc is suitable. The copper is added to the aluminum in the shape of hardener containing 50 per cent copper; 50 per cent aluminum, which is previously made, or it can be purchased ready made.

BILL

By Pat Dwyer

Tells How Retort Castings Are Made

"THIS a rare and wonderful gift," Bill remarked the other night, after a prolonged period of silence. "Many and many a time have I wished that my old fairy godmother had been a little less lavish with the good looks and one thing and another and a little more generous in other respects. Now f'rinstance—" "I don't know about the other gifts," I said, "but of a certainty you were not concealed behind the door or under the bed when the beloved little old lady was distributing her packages of conceit. Good looks and one thing or another, hey? Next time you put on the wishing cap you might improve your time profitably by praying earnestly for better eyesight." "Nothing wrong with my eyes," Bill remarked complacently. "They may not be as large and round and soft as those of a cow or a movie heroine, but in all modesty I may be pardoned for remarking that there isn't much gets by 'em. I don't wear 'em out casting envious glances at those who are more favored in personal appearance.

"However, that has nothing to do with the present burning question before the house. The gift I have in mind is the ability which some fortunate lads have of being able to stand up without a moment's notice in a public place and talk easily and fluently to a crowd of strangers.

"A gift of that kind is more precious than rubies. It is beyond price. Some men have it. Others—the great majority—have not and that's all you can say about it. I have heard that the ability to talk in public may be cultivated, but the average man never has sufficient opportunity to become proficient. Either he remains dumb, or he stutters and stumbles in a pitiful manner on the few occasions he is called upon.

"These men have my profound sympathy, probably because I am one of 'em, and therefore can realize to the full the agony of the ordeal. On the other hand I am irritated beyond decent Christian limits by the type of speaker who is not embarrassed but who apparently has to grope in unseen depths for nearly every word and who fills in the spaces with prolonged Ah-ah-ahs.

"In the course of a long and fairly variegated life I have figured in many embarrassing situations, the remembrance of which for years afterward caused the hot blood to tingle from my feet to the tips of my ears. On a few occasions I have missed the

One Reason Why Boys Leave School

swing of the grim reaper's scythe by such a narrow margin that the recollection invariably induces a cold and clammy sweat. I have seen men killed and others horribly injured and I have stood by, silent and helpless, at births and deaths and have felt my insides contract as in the grip of a giant hand, but the most poignant experience of all—perhaps because it was the first—centers around the occasion when I was elected to speak a piece at the closing school exercises. I'll never forget that if I live to be as old as Methusaleh's grandfather."

"A perfectly ghastly form of torture," I admitted. "Perhaps I am doing the teachers a grave injustice—their motives may have been of the best—but it seems to me they showed a lamentable knowledge of boy nature in the pieces they picked out for declamation. Instead of selecting a good, rousing, rattling, lilting description of battle, murder and sudden death, something into which a normal boy could throw himself with enthusiasm, they ordered the unhappy victim to stand up and repeat a composition of whose meaning he had not the slightest conception. Some of these pieces are puzzles to me even down to the present day.

"I was reading the other day of a boy who was asked to give in his own words the meaning of the sentence: 'In ancient mythology, Charon was the person who ferried souls over the Styx.' He gallantly rendered it 'Away back in de olden time Sharon wus de guy what fried soles over de sticks!'" "Well," Bill said. "Perhaps the kid was not so far astray. Without stretching the imagination to anything like the elastic limit, one easily can envisage the old bird cooking up a mess of fish for himself in a slack period. Whether soles were or were not indigenous to the Styx is open to question, but that is only a minor point not worthy of consideration. According to all accounts Charon was rather a queer fish himself. When I was a little barefoot gossoon, over in the owld dart, I had progressed at the age of nine to the *Third Book*. This noble volume contained a wide variety of selections in prose and poetry, some good, some bad and some, as the saying goes, indifferent. Without doubt all were good in the eyes of their authors and I have a sneaking suspicion that this belief was shared by the grim jowled old master who sat on the platform.

"Looking back now through the window of a wider experience I am willing to concede that his taste was better than mine, but at that time, if our position had been reversed, I would have rewarded him with a minus zero for his selection of a poem for public recitation."

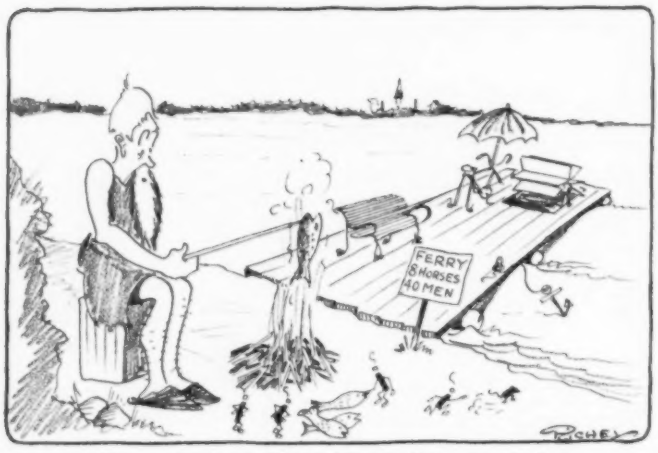
"Tell me the worst, dear lad. I am a little hazy on the publication dates of some of the faithful old standbys, but if they were in existence at the period you mention, I should say you were sentenced to repeat either *Thanatopis* or *An Ode To a Grecian Urn*."

"Never heard of 'em. You must be thinking of some fella before my time. The Grecian urn, now—Say! You don't happen to know, do you, whether it was a cast metal job or just another piece of carved marble? Did the poet say anything about who made it or what kind of stuff he put into it? Some of these old Greek birds were right handy. I saw a job one time—"

"Bill," I said, "a complete and comprehensive answer to both of your leading questions may be summed up in the single word 'No.' I read both of these compositions in my youth and they might as well have been written

in early Iroquois for all the meaning they conveyed to my mind."

"Iroquois? What do you mean Iroquois? According to Fennimore Cooper, the Iroquois certainly were humdingers in ground and lofty oratorical feats, but Fen, even in his wildest flights of imagination never credited them with a written language. The same goes for the other members of the once powerful Six Nations, Mohawks, Oneidas, Senecas, Cayugas and Tuscaroras. They used a few primitive signs now and again like the average molder making a sketch in the sand with the toe of his shoe or an old rusty nail, but a written language—"



Charon Tries a Little Mugup Between Trips

"Well?" I said. "That is what I said. The stuff might just as well have been written in early Iroquois. There was no early Iroquois and there y'are!

"The *Grecian urn* and *Thanatopsis*—maybe that is not spelled right—all I can remember is that it had nothing to do with tops of any kind—represented to my early mind the absolute triumph of the word-juggler in putting together a great number of words that meant nothing, that began without a beginning and ended without an end.

"They conveyed no meaning to my mind at the time I waded through them and I have had no curiosity to examine them in recent years when presumably I might be in a position to appraise them intelligently. They are out, definitely and for all time. I don't care if I never see or read either one of them.

"However, your pardon dear lad for rambling so far afield. My own private antipathy suggested that you might share my views on certain sterling pieces of literature. Your manly and straightforward denial of any acquaintanceship with these gems leads me to wonder what particular piece you loathed with the greatest intensity. Let me see now. How about *To a Daisy? Lines on Solitude? The Dying Duck? Ode To a Waterfowl? The Awakening of the Poppies and*—"

"Aw, for the love of Pete, pipe down, lay off and give me a chance. You remind me of the most loathsome of all human being—if he is human—the bird behind the counter who insists on telling me all the things I should have, before I have the opportunity of telling him briefly what I intend to have.

"None of the pieces you mention come within a mile of the piece of tripe that was wished on to me on the memorable occasion to which I referred some time back. It would not have been so far back if you had allowed me to continue instead of butting in with a stream of irelevant material. By this time this interesting session would have been over and we would have separated for our respective homes and—er—all that kind of thing.

"Have you ever read the poem about the White Ship?"

"You mean the one where old what's-his-name never smiled again and all that kind of gloomy drivel? If that is the composition you were ordered to memorise and deliver I am not surprised that you still harbor bitter feelings. A maudlin attempt to excite sympathy for a hijacker. The youngest son of William the Conqueror he grabbed the throne when one brother was killed and the other was away fighting in the Crusades. When the crusading brother returned Henry granted him a little pension and ordered him to stay away from the royal place. Directly and indirectly he was responsible for the drowning of his only son William. If Henry had not seized the throne of England his son would not have gone to France. If he, the son had not gone to France he would not have taken passage in the White Ship. If the son had not been a prince the whole gang including the pilot would not have become stewed to the gills and the ship would not have been lost. No, no, my brave lad. I do not wonder that you balked. That you refused to put the tremolo stop on the touching passages in that selection."

"Wait a minute," Bill interrupted. "Wait a minute. You got me all wrong on this thing. I was not familiar with all that background and did not know whether the old boy was Henry I or Henry 101. In fact down to this day I don't know how many Henries sat on the jolly old throne of England.

"The subject matter of the poem did not concern me. I memorized the words readily enough and was perfectly indifferent whether one or forty princes were drowned. If I had been allowed to stand up and race through the thing in one or two long breaths, possibly I might have braced myself to the ordeal.

"That was not the master's idea. He insisted that the wretched thing should be delivered with rising and falling inflections of the voice and with suitable gestures to illustrate practically every line. I simply could not do it.

"When the great hour arrived I had to be pushed on to the platform. I feebly croaked the words of the opening line. 'The bark that held a prince went down'—and then I went down, down and out. I did not dare lift my eyes. My arms hung like lead and my stomach shrank until it felt as small and as hard as a 5-cent orange forgotten on the pantry shelf for six months. My throat became so dry I could not articulate another word, but—probably as a compensating feature—a flood of tears gushed from my eyes and I was towed away in disgrace. Another marine disaster, you might say, sunk, lost with all hands.

He Is Thinking of Another Belt and a Sock

"Let us talk of something pleasant. I had a letter from a man the other day inquiring if I knew of any book containing information on the best method for molding, gating and pouring cast iron retorts. He supplied a sketch with the weight and dimensions, 3 x 12 inches on the inside, 4 x 13½ inches on the outside, 8 feet in

length and weighing approximately 500 pounds.

"So far as I know, information on how to make this particular casting never has appeared in any of the books devoted to a description of foundry practice. The castings are employed in considerable numbers in sugar factories and, almost without exception, are made in foundries which specialize in castings for the sugar industry. The retorts are exposed to high temperatures and consequently must be homogenous in structure, absolutely uniform in metal thickness throughout and free from any exterior or interior flaws. Although apparently simple, the manufacture of these castings calls for a high degree of skill and experience. Over a period of many years certain foundries have developed methods and equipment which have removed many of the hazards from the job, but the cost of this equipment only has been justified on the basis of large output.

Molds Casting Horizontally

"The easiest method for molding this casting is to place it horizontally in a drag as shown at *A* and *B* with a slightly dipped parting, or, a flat parting, depending on whether the bars in the cope are straight or cut out slightly to accommodate part of the pattern. Unfortunately, at least six chaplets would be required to hold the core in position in this mold and that feature automatically rules the method out of consideration. To the particular class of men who order these castings, chaplets constitute a defect and they will not accept them.

"The next easiest method is illustrated at *C* with the pattern on edge, but still in a horizontal position. This method also is ruled out for two reasons. The first is that at least one chaplet is required on the top to prevent the core from springing upward in the center. In almost every instance the core will spring slightly to one side or the other unless a chaplet is placed in the center at either side to prevent this movement. The second reason is that unless the flask—even an iron flask—is strongly braced across the center, it will spring outward when the mold is filled with iron and as a result the casting will be thicker in the middle than at the ends. The deviation in thickness, from any cause, may not amount to more than ⅛-inch—a feature of little or no consequence in many castings—yet it is sufficient to condemn these extremely particular castings.

"Experience seems to indicate that the only satisfactory method of producing these castings is to pour them while the molds are in a vertical position. In effect the method is the same as that which has been employed for so many years by the manufacturers of cast iron pipe. The mold is set up, the core is lowered into it. A collar core with a number of gate gaps, engages the upper end of the main core and holds it central. The lower end is located by a tapered print. A basin on top of the collar core supplies metal to the gates and as a result the mold is filled rapidly and uniformly and no pressure is exerted against the sides of the core to force it out of place.

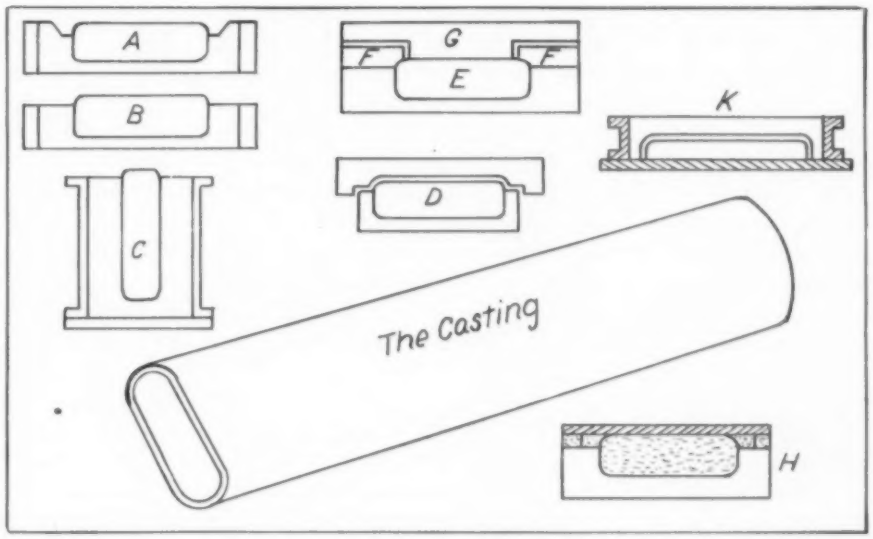
"Practically the only detail in which any difference is shown is in the method of preparing the mold and in the type of flask employed. In one typical installation the two part flask, conforming closely to the shape of the casting, is hinged along one joint and clamped at the opposite side as in cast iron pipe practice. The flask is opened to remove the sand and casting and then closed, clamped and placed once more over the vertical pattern mounted on a jolt machine. The machine works in the bottom of a pit in the foundry floor and as each mold is rammed, the pattern is withdrawn and the mold is lifted from the machine and placed on a permanent base corresponding to a drag and containing the lower core print.

"In a second installation the mold is made, dried and cored horizontally and then upended before the metal is poured into it. In this instance a half pattern is mounted on the table of a jolt machine. Since the pattern is symmetrical all the resulting half molds are alike. The flasks are interchangeable and therefore any pair may be assembled to form a complete mold. A projection on the print designed for the top, forms a seat for the collar core containing the gates.

"Two methods of making the core are shown at *D* and *E*. In the method shown at *D* the core is made and dried in a metal form. This form corresponds to the usual corebox and extends approximately to a horizontal center line on the core. The sand is packed in a mound and then the upper shape of the core is imparted by a strike which slides along the edges of the corebox shown in the sketch.

"In the method shown at *E* a wooden corebox is employed. This corebox is in two parts. The lower part extends upward to a point where the upper curve commences. After the sand has been rammed in the box to this level, the second part of the corebox *F* is placed in position. This part is an open frame and is designed principally to form the upper curves on the sides of the core. The strike *G* forms the upper flat surface of the core. The frame then is removed and replaced by a plain rectangular frame or false box. Molding sand is packed inside this frame and a core plate adjusted as shown at *H* and the assembly is rolled over.

"In both instances the cores are rodded and vented as in ordinary practice and in the second instance hooks are provided at one end for lowering the core into the mold.



Alternative Methods for Making the Mold and Core for a Retort Casting

New England Founders Hold Meeting

The regular monthly meeting of the New England Foundrymen's association was held May 13 at the Engineers club, Boston. Luther J. Anthony, president of the association, presided at the meeting and introduced E. H. Ballard, General Electric Co., West Lynn, Mass., as the next president of the American Foundrymen's association. Mr. Ballard responded with a few remarks. The chairman then introduced A. V. Phillips, Angus Co., Calcutta, India, who spoke briefly. Frank D. Chase, president, Frank D. Chase Inc., Chicago, was the speaker of the evening and chose for his subject, "Foundry Engineering in the United States and in Russia." The talk was illustrated and was followed by a lively discussion. Forty-one members and guests attended the meeting.

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The Shakeout

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¶ No Time for Free Rides

IF THE good deacon whose moral scruples prevented betting, but permitted him to prophesy ten dollars on a horse race were to join the ranks of business prognosticators, he might find a safe investment on the forecasting market. He would be safe in risking his savings on the assertion that the next swing of the economic cycle will see greatest progress in those industries which possess active, alert co-operative organizations. President Hoover has stated that every development of industry renders trade associations more essential to sound growth. This statement has been tried and proved by conditions in the past few months. Those industries which are without the co-operative spirit and militant support of trade associations are in a chaotic state.

THE foundry industry presents a united front to the onslaught of the new competition. Organized in three groups representing three branches of castings manufacturing, the industry can, by proper co-operation, gain and hold new ground in the battle for business that impends. With the Malleable Iron Research institute, the Gray Iron institute and the Steel Founders' Society of America properly co-ordinated and representing a large and important part of the entire foundry business, greater opportunities are offered than ever before. The similarity in scope and precepts, the ability to co-operate in improvement of product, stabilization of costs and advancement in merchandizing and distribution are marked assets to the foundry business of the next decade.

THE prophesying deacon would be safe in backing the assertion that tomorrow's successful foundryman is active today in his trade association movement. The loss to the nonmember is not always apparent, as stated recently by Charles F. Abbott, executive director, American Institute of Steel Construction, who said:

> The greatest weakness at present in our trade association movement is the inability of obtaining the membership of *all* who are profiting from the fruits of the co-operative. There are, even in times less depressing than the present, certain nonmembers who prefer to ride free. They take their profit from improvements in industries effected through trade associations without being willing to stand their part of the expenses.

This is no time for free rides. For the good of the industry, for the promotion of wider use of castings, for the profit and prosperity of the individual firm, every foundry should be a member of the trade association which represents its own branch of castings manufacture.

¶ Malleable Has Gained

REAL progress in the malleable iron casting industry may be said to have commenced in 1913 when the American Malleable Castings association undertook as one of its activities to carry on extensive research work for the benefit of its members. At that time a few of the large manufacturers maintained adequate laboratory facilities to investigate and control their methods, but the smaller manufacturers had to get on as best they could. Up to that time also a certain amount of secrecy surrounded the operation of each plant and this not only obtained between rival manufacturers, but included relations with customers and with the public in general. That this was a mistaken policy is shown by the vast increase in the production of malleable castings in the years since research and co-operative action was inaugurated.

Casting standards were raised in ultimate strength, in ductility as shown by elongation tests and in reduction in area and in adaptability in many fields formerly considered closed to this metal. In early years confined to harness hardware and other small castings, malleable iron now is found in many mechanical devices.

THE Malleable association, now the Malleable Iron Research institute, was the first of the metal groups to sense and take advantage of the evolutionary period through which the foundry has been passing during the past 20 or 25 years. This evolution in keeping with a general evolutionary movement extending into practically every phase of human activity has been described as a speeding up of mass consciousness along various lines. The institute through its newer activities has vastly extended the market for malleables in recent years. The future is bright for malleable castings and the increase, expansion and prosperity of the following 10 years probably will be greater than those of the decade immediately preceding the present low peak in the operation curve.

Through belief in the principles and policies of the Malleable Iron Research institute, THE FOUNDRY has dedicated the front cover of this issue to this trade association of the malleable industry.

Comings and Goings of Foundrymen

Men of the Industry, Whose Activities Are Making Foundry History

HERMAN MITCHELL, formerly employed in the foundry of the Auto Specialties Mfg. Co., St. Joseph, Mich., has been appointed plant superintendent of its Canadian plant at Windsor, Ont. Mr. Mitchell began his foundry career as an apprentice with the Wm. E. Pratt Mfg. Co., Joliet, Ill. He served as coremaker in that plant from 1910 until 1913 when he resigned to take charge of the core department, Vermilion Malleable Iron Co., Hoopeston, Ill.

Jean Dessent

He remained there until 1918 when he enlisted in the service. Following his discharge he took a position with the Buckeye Jack Mfg. Co., Alliance, O., and placed its malleable iron foundry in operation. He took charge of the core department in that plant and remained until 1920 when he resigned to accept a position as general foundry foreman with the Gillian Mfg. Co., Canton, O., with which he was affiliated until 1922. At that time he became associated with the Cadillac Malleable Iron Co., and had charge of its core department until 1924 when he was appointed foundry foreman and in 1925 was promoted to foundry superintendent. He held that position until 1929 when he resigned to accept a position in the foundry of the Auto Specialties Mfg. Co., St. Joseph, Mich., a position he held until his recent promotion.

Jean Dessent, co-author of the exchange paper of the Belgian Technical Foundry association, "A Contribution to the Study of the Part Played by Phosphorus in Cast Iron," which was presented at the recent A. F. A. convention, was born in Jumet, Belgium, Jan. 1, 1905. He received his education at the University of Liege from which he was graduated as a mining engineer and now is assistant lecturer in metallurgy at that institution. Mr. Dessent is the author of many technical papers both by himself and in collaboration with Prof. Thyssen on metallurgical subjects. He also has published one paper in cooperation with Prof. G. Batta. Mr. Dessent is a member of the committee of the Association of Engineers of the Ecole de Liege and of the scientific committee of the Belgian Technical Foundry association.

Moise Maxime Kagan, co-author of the Belgian Foundry Technical association exchange paper, presented at the Chicago convention of the A. F. A. was born in Minsk, Russia, Feb. 22, 1889 and is a metallurgical engineer of the University of Liege and a director of Fonderies de Bressoux. Mr. Kagan has devoted himself particularly to the study of pearlitic iron and has been associated especially with the introduction of black-heart malleable iron into Belgium. He presented a paper entitled "Black-heart Malleable" at the International Congress of Metallurgical Construction held at Liege in 1930. Mr. Kagan is a member of the scientific committee of the Belgian Technical Foundry association and has been active in the investigations conducted by that group.

Bradley Stoughton, head of the department of metallurgy, Lehigh university, Bethlehem, Pa., recently was elected president of the American Electrochemical society.

Carl J. Jernstrom, for the past nine years superintendent, Riverside Steel Casting Co., Newark, N. J., recently became affiliated with the Roxbury Steel Casting Co., Boston.

Joseph Miller has been appointed superintendent, Kenton Foundry Co., Kenton, O. The foundry is owned by Malo Bros., Marion, O., dealers in iron and steel scrap.

R. H. Ripley recently was re-elected president, General Steel Castings Corp., Eddystone, Pa., and in addition was elected to the office of chairman of the board, succeeding **Clarence H. Howard,** resigned.

F. E. Ross has been elected president and general manager of American Furnace & Foundry Co., and of American Boiler & Foundry Co., Monroe, Mich., to succeed **E. C. Watson,** resigned. **Charles W. Steidle** was named secretary-treasurer for the two companies, succeeding Mr. Ross.

Harrison Hoblitzelle, vice president and general manager of the Commonwealth division, General Steel Castings Corp., Granite City, Ill., formerly Commonwealth Steel Co., has been elected executive vice president in charge of operations of the Granite City and Eddystone, Pa., plants. His headquarters will be in Philadelphia. Mr. Hoblitzelle became iden-

Moise M. Kagan

tified with Commonwealth organization in November, 1917, in the purchasing department. He later was made vice president in charge of sales, and then vice president and general manager.

Archibald Hazlehurst has been appointed manager of sales, Sterling Steel Foundry Co., Braddock, Pa. He formerly was associated with American Steel Foundries in Chicago and Pittsburgh.

John H. Lock, affiliated with Commonwealth division, General Steel Castings Corp., Granite City, Ill., and its predecessor, Commonwealth Steel Co., since 1912, has been promoted from assistant general manager to general manager of that division.

J. M. Kaufman, formerly superintendent of the malleable iron foundry, Stockham Pipe & Fittings Co., Birmingham, Ala., has resigned to become superintendent, Jefferson Union Co., Lockport, N. Y. Prior to his association with the Stockham company, Mr. Kaufman was produc-

tion manager, Meadville Malleable Iron Co., Meadville, Pa., from 1920 to 1930. During 1930, he was associated with the Stockham company.

G. E. Clark, formerly associated with James H. Beans Foundry Co., Martins Ferry, O., recently has been appointed general foundry foreman, Youngstown Foundry & Machine Co., Youngstown, O.

Harold P. Mueller, formerly vice president and director of sales, L. J. Mueller Furnace Co., Milwaukee, has been elected president and general manager to succeed his father, the late L. J. Mueller Jr., who was president and treasurer. **Paul E. Mueller** has been elected to the newly created office of chairman of the board. **Gustave C. Mueller** continues as vice president, and **Joseph Schlueter** has been elected secretary and treasurer.

Frank D. Chase, president, Frank D. Chase Inc., Chicago, architect and engineer, has been installed as president of the Western Society of Engineers. Vice presidents are **D. J. Brumley,** chief engineer, Chicago terminal improvements, Illinois Central railroad; **Harry B. Gear,** assistant to the vice president, Commonwealth Edison Co., Chicago, and **Charles C. Whittier,** engineer, Robert W. Hunt Co., Chicago. **Leigh S. Keith** has been re-elected treasurer.

John M. Lessells, formerly manager of mechanics division, Westinghouse Research Laboratories, has been appointed manager of engineering in the South Philadelphia works of the company. He succeeds **A. D. Hunt,** resigned. Mr. Lessells was born in Dunfermline, Scotland, in 1888 and was educated at Heriot-Watt college, Edinburgh; University of Edinburgh; and University of Glasgow. He holds a degree of bachelor of science in engineering, both mechanical and electrical, from the latter institution. Mr. Lessells joined the Westinghouse company in 1920 and has risen gradually to his present position.

Frank Bonnievier, formerly assistant foundry foreman, Forest City Foundries Co., Cleveland, has resigned that position to become assistant foreman, Ft. Pitt Steel Casting Co., McKeesport, Pa. Prior to his association with the Forest City company, Mr. Bonnievier was assistant foundry foreman, Fox Furnace Co., Elyria, O. He is a native of Sweden where he served his apprenticeship as a coremaker. In 1922 he came to the United States and since that time has worked in Massillon, O., Pittsburgh, and Seattle. He also was at one time affiliated with the Ford Motor Co., Fordson, Mich., and with the American Radiator Corp., Buffalo, at the Austin Arcola plant.

Foundry Industry Played Important Part

When the National Newark & Essex Banking Co., Newark, N. J., recently moved from its old quarters into the new Newark & Essex building, that company published a bulletin describing the place that it has occupied in the community for 127 years. On the walls in the main banking room are 10 murals executed by J. Monroe Hewlett, assisted by Charles Gulbrandson, depicting the growth of the city of Newark and its industries. From the early days, the foundry has been one of the major industries of the community and that well known historical figure of the malleable iron industry, Seth Boyden, played an important part in its development. One of the murals has Seth Boyden for its central figure.

In describing the place that the foundry industry has played in the development of Newark, the bulletin says:

"The iron deposits of Northern New Jersey attracted early attention in the days when charcoal smelting was the standard. It was not long in coming to Newark to be worked into useful forms. Somewhere before 1768 Newark had a foundry on the north corner of Washington and James streets where the Second Presbyterian Church now stands. It was known as the Vesuvius Furnace. Moses Ogden was one of its first owners and in 1769 Ogden Laight succeeded him. There exists an advertisement important enough to quote:

" 'Makers of all kinds of hollow ware and other castings usually made at air furnaces; such as forge hammers, anvils, pots, kettles, griddles, pyepans of various sizes, potash kettles and sugar boilers, calcining plates, plain and ornamental chimney backs, jaumb and hearth plates neatly fitting each other. Bath stoves for burning coal, iron stoves for work-shops and ship cabins, Dutch and perpetual ovens, boiling plates, boxes for carriages of all kinds and sizes, half hundred and smaller weights. As their metal is of the best quality, and the construction of their furnace, manner of working and moulding of the most improved; their ware is equal if not superior to any made in America or imported; particularly the metal for hammers and anvils for forges is excellently well tempered, and found on repeated trials to be in general superior to English hammers, etc.

" 'Any person wanting any of the above articles, may have them from either Edward Laight at his store in New York near Cowfoot Hill, or of James Abeel near Coenties Market or Gabriel and Lewis Ogden at the furnace in Newark, New Jersey. Castings of any particular kind may be made by applying to any of the above persons. N. B. Bar iron will be taken in payment for hammers and anvils at market price.' "

"In 1826, Seth Boyden added malleable iron to his long list of inventions and discoveries. Only Boyden's modesty prevented him from taking high mark among America's spectacular geniuses. To mention just a few of his numerous activities, he made watches, invented the machine used to split leather, made in 1825 a steam engine, which is preserved in the technical school, a telescope, an air-gun, one of the first daguerreotypes of the country, invented the cutoff for the steam engine, meddled with electricity, found out how to smelt New Jersey zinc ore and developed the famous Hilton strawberry. Leather and iron were the two things that progressed most by his enterprise and the foundries and engine shops of Newark trace much of their success to him."

William D. Sargent, Eastern Steel Castings Co., Newark, N. J., is a director of the National Newark & Essex Banking Co.

Faked Foundry Facts

Bedding In

Receives Advancement

W. L. Lewis, for the past year vice president in charge of finance, Chicago Pneumatic Tool Co., 6 East Forty-fourth street, New York, has been elected executive vice president of the company. Mr. Lewis formerly was assistant comptroller, Bethlehem Steel Corp., Bethlehem, Pa.

New Speed Reduces Uses Spiral Bevel Gears

D. O. James Mfg. Co., 1114 West Monroe street, Chicago, has developed an improved vertical output type of speed reducer with spiral bevel gears, which is said to give unusually smooth and quiet operation. One of these units with its cover removed to reveal internal construction, is shown on the accompany illustration.

The unit consists of a circular cast iron housing in which the gears run immersed in oil and which thoroughly protects them against the penetration of dust and dirt. The imput, or pinion shaft, enters the side of this housing through an oil seal. Pinion and gear are of improved form which gives maximum number of teeth in contact and maximum contact between individual teeth. Both, gear and pinion shafts are carried on roller bearings.

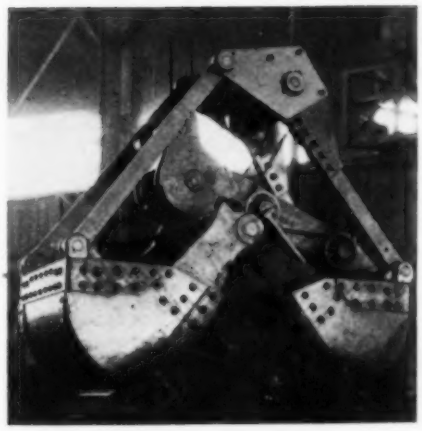
Both Gear and Pinion Shafts Are Carried on Roller Bearings

Where large ratios of reduction are required, this type of reducer is furnished integral with a planetary reduction unit, making ratios ranging from 8 to 1, to 1600 to 1 available. The units are built in sizes to transmit loads ranging from ½ to 100 horsepower.

Heavy Duty Bucket Is of Hook-on Type

Erie Steel Construction Co., Erie, Pa., recently introduced a hook-on or single line clamshell bucket which it is claimed is designed to give 10 to 25 per cent more closing power than those previously made. Complete operation of the bucket is carried on from the crane cab and the action is quick, positive and safe because the latching mechanism cannot become disengaged accidentally.

The closing line is reeved around snubber sheaves which tend to eliminate serious opening shock. When the bucket is open, the power arm comes to rest against heavy bumper springs which act in combination with the rope reeving to give smooth operation. As shown in the accompanying illustration, the scoops are reinforced. High carbon steel lips extend to the top of the scoops and tie in with hinges at that point. The back band extends entirely around the scoop and also ties in with the hinges.



The Bucket Is Built To Withstand Severe Service

Corner bars are drop forged from solid bars and are attached to the scoops with corner brackets which are riveted securely to the sides and backs of the scoops. Those brackets extend over the tops of the scoops to relieve the down thrust on the rivets. Moving parts are bronze bushed and are lubricated with a special lubricating system.

Reader's Comment

(*Concluded from Page* 48)

Many small castings must be made with closed or what we term blind risers to prevent this action on delicate surfaces. Without the blind riser which in reality is a closed riser, many castings of a light delicate character could not be produced clean at least on a production basis.

The open riser in many cases is a menace to clean castings as there is always danger of loose sand getting into the mold through the open riser.

We have made wonderful progress in the foundry business in the past 30 years, but there are some things we must do today that my grandfather did 50 years ago, if we expect to make good castings.

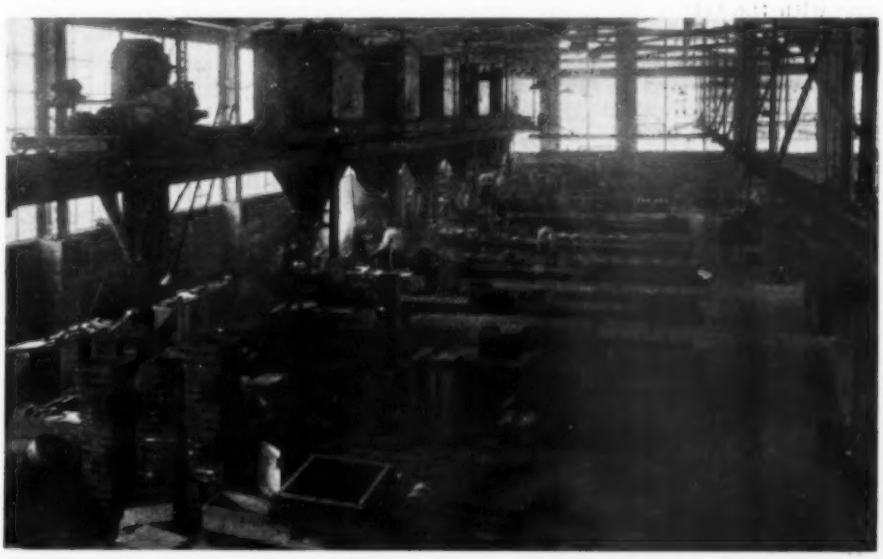
PAUL R. RAMP
5807 *Cabanne avenue,*
St. Louis.

Unit Combines Pouring and Sand Handling

Modern Equipment Co., Modern Pouring Device division, Port Washington, Wis., recently has placed on the market a new unit which combines sand handling and pouring operations. It is claimed that the unit gives a large production per square foot of floor space; conditioned, uniform sand; and large mold production. A unit of this type enables each molder's sand to be conditioned individually. It is claimed that the unit gives economical performance in both large and small shops.

Complete units consist of an overhead, portable conditioning apparatus, a series of floor bins or overhead hoppers for sand storage, gravity mold conveyors and a pouring system. The portable unit is hand propelled and an 8-horsepower motor operates the entire system. Each molding station is equipped with two conveyors which are located conveniently close to the molding machine.

The system works in the following manner: Molds are made, set on the gravity conveyor and poured. After they have cooled, they are placed on a vibrating screen which eliminates core sand and refuse when the casting is shaken out. The sand is moistened and conveyed to the conditioning unit by a bucket elevator. After the sand is conditioned, it is thrown into a hopper or bin and is ready for use. It is claimed that the portable sand conditioning unit gives a fluffy well-aerated sand

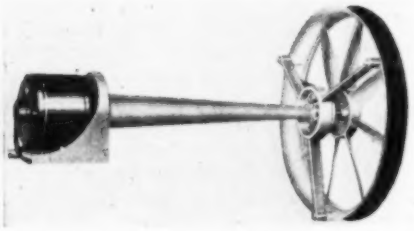


The Unit Is Applicable to Both Large and Small Foundries. It May Be Used To Prepare the Sand for Each Floor Separately

of a uniform texture. The accompanying illustration shows an installation of the combination sand handling and pouring unit.

Propeller Type Fan Has Extension Shaft

Propellair Inc., Columbus, O., recently has introduced a new type extension shaft fan built on the airplane propeller principle. The unit may be utilized for any application where medium pressure is necessary and where the motor must be kept out of the air flow. Particular attention has been paid to the length of the extension in designing the new fan. Each extension is designed to fit into an elbow in a duct line so that the elbow proper is 1½ times the diameter of the duct. With a



The New Fan Is Designed To Give High Efficiency

fan of the type mentioned equipped with a proper length extension, it is claimed that installation is simplified, the cost reduced and efficiency increased. The accompanying illustration shows one of the new units.

Pneumatic Grinder Has Single Rotor

Cleveland Pneumatic Tool Co., Cleveland, recently placed on the market a new type portable pneumatic grinder. The unit is designed with a single rotor which is concentric with the arbor, providing a good balance at all speeds. That type motor is claimed to have great power in compact form and to operate with the minimum vibration and recoil. The rotor is provided with four longitudinal slots to accommodate four separate blades. When the machine is in operation, the blades are forced outward toward the wall of a stationary cylinder concentric to the axis of the rotor. One blade always is exposed to the air current to provide constant rotation.

The arbor, to which the rotor unit is attached, is rigid and is made of hardened and ground steel. It is equipped with a combination annular and thrust ball bearing at the rear end and with a double row annular ball bearing at the forward end. The governor is a detachable unit and when in operation, controls the amount of compressed air used. When the machine is running light

This Grinder Is Made in Several Sizes and Styles

and is not grinding, the air consumption is reduced to about one-third. When grinding, the governor opens gradually as the pressure is applied until maximum load on the wheel is reached.

An oil reservoir in the rear of the grinder body automatically lubricates the rotor. Flow of oil is controlled by the governor. That lubrication system allows the oil to flow through large unrestricted passages to give steady and free lubrication without danger of foreign material clogging the oil supply. The grinder is made in several sizes and styles. Two types of handles provide outside or inside throttle lever control as desired.

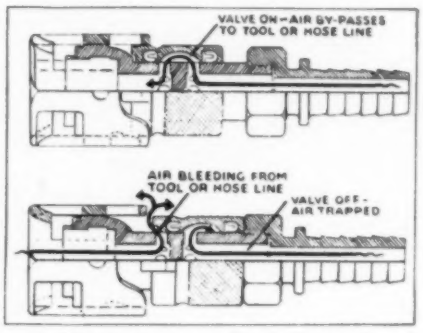
Hoist Is Designed for Close Headroom

Shepard Niles Crane & Hoist Corp., Sprague Electric Hoist division, Philadelphia, recently has placed on the market a new electric hoist made in capacities of ¼ and ½ ton. The unit is actuated by a ball bearing motor made by the General Electric Co., Schenectady, N. Y. and wiring is enclosed entirely in conduit. The unit may be controlled either by pendant rope as shown in the accompanying illustration or by push button as desired. The hoist is enclosed both electrically and mechanically and is suitable for both indoor and outdoor operation. The trolley is of the swivel type with ball bearing wheels which permit easy operation around short radius turns. Features of the new type unit include compactness, close headroom operation and simplified worm drive.

Electrical and Mechanical Enclosure Is a Feature

Compressed Air Valve Operates Easily

C. B. Hunt & Son, Salem, O., has placed on the market a new type valve for compressed air. The valve is located in the hose line and is easily operated. Air pressure to the tool is turned off and on by sliding a sleeve backward and forward. The valve sleeve is equipped with two *U* leather packings and traps air in the off position. Air is bled from the line automatically when the valve is closed, while moving the valve sleeve forward by-passes the air through the coupling. The valve sleeve is between coupling jaws when the valve is open and therefore cannot be disconnected. The *U* leather packings are pressure seated by the air and consequently, the higher the pressure, the tighter the seal. Claims



The Valve Is Operated by Sliding the Sleeve Forward

made for the unit, shown in the accompanying illustration, are quick operation, dependability and low cost.

St. Louis Group Meets

The regular monthly meeting of the St. Louis District Foundrymen's club was held in the American Annex hotel, May 28. The high point of the meeting was the annual election of officers. The following men were chosen: W. C. Raithel, Century Electric Co., St. Louis, president; H. Hubbell, Semi Steel Casting Co., St. Louis, vice president; and L. J. Filstead, John C. Kupferle Foundry Co., St. Louis, secretary and treasurer. Members of the executive committee include H. R. Culling, Carondelet Foundry Co., R. M. Hill, East St. Louis Castings Co., East St. Louis, Ill., K. Green Jr., Green Foundry Co., A. V. Wadsworth, Wescott Valve Co., East St. Louis, Ill., W. J. Hale, Southern Manganese Steel Co., and W. J. Rinehart. H. Linn, Beardsley & Piper Co., Chicago, gave an illustrated talk showing motion pictures of foundries where that company has installed equipment. A discussion followed the talk.

Garret A. Connors has been elected vice president, director of purchases, Truscon Steel Co., Youngstown, O.

What Others Are Thinking

Abstracts Selected from European Foundry Literature

Makes Cores Pneumatically

Pneumatic Core-making, (Noyautage a l'Air Comprime) by U. Lohse, *La Revue de Fonderie Moderne,* Paris, March 10, 1931.

The sand container of a German pneumatic core-making machine is a revolving drum which presents a series of holes on both sides near the outside circumference. The holes of each side of the drum are exactly opposite each other. The core box is applied against one side of the drum, and a cylindrical cartridge is pushed through the holes of the drum against the opening of the core box. The movement of the cartridge is obtained by air pressure, and as the cartridge goes through the drum it fills itself completely with sand. Once the cartridge is applied against the opening of the core box, a jet of air ejects the sand under pressure into the core box. The movements of the drum, of the cartridge and of the air valve in the machine naturally are related to one another. The machine is described in detail, and illustrated.

The capacity of the cartridge is 4.5 kilograms (9.9 pounds) of sand. If the core box is of a large size, several cartridges must be used. If, on the other hand, a core box does not contain as much sand as is contained in the cartridge, the cartridge is discharged only partially into the core box, but great care must be taken that sand only is pressed into the core box, and that the cartridge is never completely empty, as otherwise air would be mixed with the sand and the core would be defective. The cartridge which is made of brass, has a diameter of 110 millimeters (4.33 inches) and is 400 millimeters (15¾ inches) long. On continuous work the revolver consumes about 0.4 cubic meters of air per minute, and it takes about 10 seconds to empty the cartridge and bring it back into position.

Studies Cupola Operations

A Few Practical Notes on the Operation of Cupolas and the Means of Obtaining Hot Metal, (Quelques Donnees Pratiques sur la Conduite des Cubilots et les Moyens d'Obtenir de la Fonte Chaude), by E. Vroonen. *Bulletin of the Association Technique de Fonderie de Belgique,* March, 1931.

This is the second of two articles on the subject, an abstract of the first being published in the May 1 issue of THE FOUNDRY. This section is of a theoretical nature and is written around a number of tests made in the foundry of Compagnie Generale des Conduites d'Eau, Liege. The tests were made to determine the quantity of coke burned per hour and the corresponding tonnage of metal melted; the wind pressure; the temperature of the molten iron at the tap-hole; the delivery of air; and the analysis and temperature of the gas at the top of the furnace. These measurements were used to prepare a number of charts and to verify a number of formulas.

The article begins with a definition of the *life* of the metal which is the property of remaining fluid as long as possible during the period of cooling. High life may be obtained by destroying all crystal germs in the iron, and to facilitate this process, start with an iron which has as fine and homogeneous a texture as possible.

The author recommends the use of additional charges of coke from time to time between two charges of coke, pig iron and lime. The size of the coke has a dual influence. It influences the temperature of the iron and also the output under the same air pressure.

In the discussion dealing with the practical limit of wind pressures, it is concluded that in the particular type of work made in the foundry with which the author is associated, a pressure as high as 1000 millimeters does not modify the analysis of the iron, nor does it deteriorate its mechanical properties. On the contrary, it increases the melting temperature. A warning, is issued against the use of high pressure for sand cast metal as it has been found that these high pressures are related to porosity. In such cases the pressure in the foundry previously mentioned does not exceed 700 millimeters with 800 kilograms of coke per square meter and per hour.

Study Aluminum Gating

The Manufacture of Aluminum Pistons, (La Fabrication des Pistons en Aluminum) *La Fonderia,* Milano, Italy, November, 1930. Reprinted in *La Revue de Fonderie Moderne,* Paris, March 25, 1931.

A series of articles recently has been published in the Italian foundry journal, *La Fonderia,* relating to the technique of nonferrous metal founding. The article which is summarized in *La Revue de Fonderie Moderne* deals with the manufacture of pistons in aluminum or in light alloy, more particularly from the point of view of the best way to dispose the runners.

The study of a runner is based principally on the four following points: (1) dimensions and section of the channel; (2) the parts of the mold where the metal enters the mold; (3) the deviation of the channel from the vertical; (4) the section and dimensions of the point where the channel joins the mold. Generally, the section of the runner decreases from the gate down to the entrance into the mold. The height of the runner also is of considerable importance, and the best results are obtained with the highest runners, but, of course, a greater quantity of metal is needed.

It is the usual practice to employ bottom-pouring, but in many cases this method is combined with gating at other points of the mold. The drawback of bottom-pouring is that the metal which first arrives in the mold always has a tendency to cool rather quickly, and consequently it loses its fluidity and prevents quick filling of the mold. That is particularly important where there are thin sections to fill. Reference is made to a number of experiments which were made by the U. S. bureau of mines. As a result of these experiments it has been found that the best shape for the runner is a curved shape, and that still better results are obtained when the mold is inclined as the metal is poured into it. The best results also have been obtained when bottom-pouring has been combined with the entry of the metal into the upper parts of the mold.

Silicon Effects Properties

The Effect of Carbon and Silicon on the Growth and Scaling of Gray Cast Iron by A. L. Norbury and E. Morgan, *Foundry Trade Journal,* London, May 14, 1931.

An investigation was carried out on the effect of silicon and carbon on gray cast irons containing varying contents of those elements. Silicon contents ran from 1.6 to 7.6 per cent and carbon contents from 4.0 to 2.1 per cent for dilatometer tests. Results showed that growth increases as the silicon content is raised to 3 or 4 per cent but in tests in which the silicon content exceeded the latter figure, growth decreased to a small figure provided the graphite flakes were not too large. The beneficial effect of high silicon was due to its action in raising the critical point and to a greater extent in increasing resistance to oxidation.

Accellerated growth tests carried out by heating in moist CO_2 at 600, 700, 900, and 1000 degrees Cent. (1130 1292, 1652 and 1832 degrees Fahr.) on specimens having silicon contents from 0.7 to 14.6 per cent and total carbon contents between 4.0 and 1.0 per cent confirm the previously stated conclusions and also shows that scaling decreases as the silicon increases. If that element is sufficiently high, scaling and growth may be reduced to negligible quantities under severe service conditions providing the iron is made so that oxidizing gases cannot penetrate below the surface by way of graphite flakes, gas holes and cracks. The irons become increasingly brittle as the silicon content increases and are not suitable where there is rapid local heating and cooling. Tests also were conducted in an atmosphere of CO_2 and SO_2.

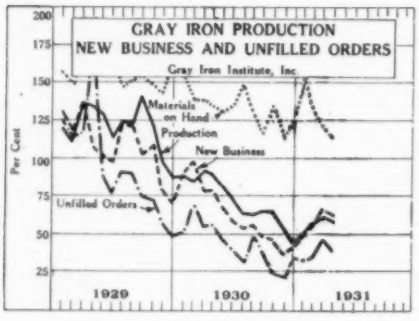
Results showed that growth is due to three factors: Graphitization of combined carbon; internal oxidation, and cracking consequent on volume changes setting up stresses which crack the iron if they occur when the iron is in a nonductile condition. The latter conclusion suggests that it is important for the iron to have a high tensile strength to withstand such stresses. Results obtained by the authors show that the property required is ductility rather than tensile strength.

Trade Trends in Tabloid

INDUSTRIAL operations in general receded gradually during May, judging from early statistics on a few important industries. Pig iron production fell off after reaching the peak in April, and with reports of curtailment in production schedules emerging from automobile manufacturing centers, it is doubtful if the output of cars for May will reach the April total.

—T—T—

Little change has been noted in foundry operations during the past few weeks. Slight declines in the



Midwest have been overcome by better sentiment in the East. The first week in June brought an improvement in pig iron demand on the seaboard.

—T—T—

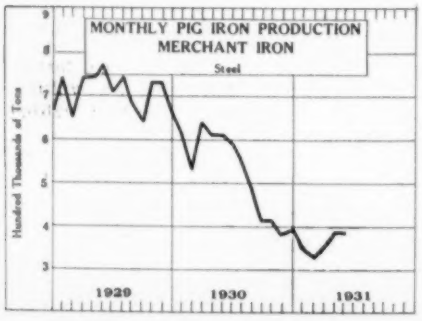
In the Pittsburgh district operations decreased moderately during the past 30 days, production of both iron and steel shops being off from the March and April peak. Schedules in iron foundries average around 25 per cent with operations usually on a two or three-day a week basis. Activity in radiator and sanitary ware producing foundries has been fairly steady, but jobbing shops are quieter. Steel foundry production is around 40 per cent.

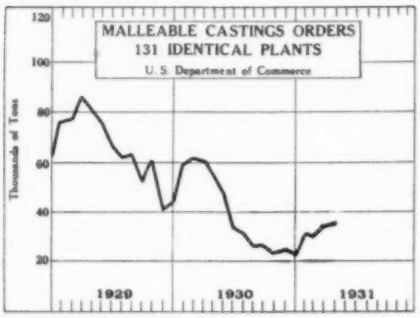
—T—T—

For the fourth consecutive month, production of automobiles gained in April, with an output of 335,708 cars and trucks compared with 276,405 units in March, according to the department of commerce.

—T—T—

Chicago district foundry operat-





ing schedules in early June were approximately 30 per cent. While no marked improvement is noted among jobbing shops in the immediate Chicago district, several plants in North-Central Illinois have increased operations.

—T—T—

Freight car loadings for the week ended May 23 again showed an increase, with a total of 755,071 cars, a gain of 7339 over the preceding week, according to the American Railway association.

—T—T—

Production of malleable castings in April was the heaviest in 10 months, according to the department of commerce. The output for the month totaled 36,356 tons compared with 35,210 tons in March. Orders also showed a gain.

—T—T—

Stove foundries throughout the Midwest are operating on a low basis. A few exceptions are noted, however,

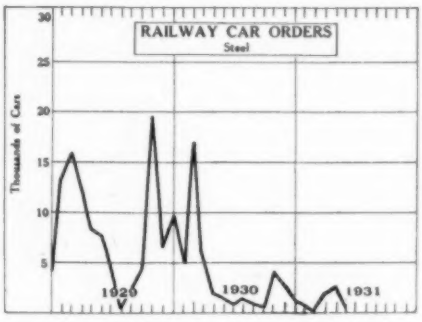
RAW MATERIAL PRICES
May 21, 1931

Iron	
No. 2 foundry, Valley	$17.00
No. 2 Southern, Birmingham	12.00 to 13.00
No. 2 foundry, Chicago	17.50
No. 2 foundry, Buffalo	17.00
Basic, Valley	17.00
Basic, Buffalo	16.50 to 17.00
Malleable, Chicago	17.50
Malleable, Buffalo	17.50
Coke	
Connellsville beehive coke	$3.25 to 4.75
Wise county beehive coke	4.25 to 5.00
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$10.00 to 10.50
Heavy melting steel, Pitts.	10.50 to 11.00
Heavy melting steel, Chicago	8.50 to 9.00
Stove plate, Buffalo	7.75 to 8.00
Stove plate, Chicago	7.00 to 7.50
No. 1 cast, New York	7.00 to 7.75
No. 1 cast, Chicago	8.75 to 9.25
No. 1 cast, Philadelphia	12.50 to 13.00
No. 1 cast, Pittsburgh	11.00 to 11.50
No. 1 cast, Birmingham	10.00 to 11.00
Car wheels, iron, Pittsburgh	11.00 to 11.50
Car wheels, iron, Chicago	9.25 to 9.75
Railroad malleable, Chicago	9.50 to 10.00
Agricultural mal., Chicago	9.00 to 9.50
Malleable, Buffalo	10.50 to 11.00
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	7.87½ to 8.00
Straits tin	22.35
Aluminum, No. 12, producers	22.00
Aluminum, No. 12, remelt	9.00 to 10.00
Lead, New York	3.75
Antimony, New York	6.30
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	3.20

one being the Kalamazoo Stove Co., Kalamazoo, Mich., which is maintaining fairly steady operations. It is expected that the company will have a highly satisfactory year, and is pointed out that if the year's business equals that of 1930, a much greater profit will be expected due to operating economies which have been instituted.

—T—T—

Pig iron production in May turned down for the first time in five months, according to *Steel*. Average daily production in May was 64,355 tons



against 66,986 tons in the previous month. Merchant iron totaled 392,630 tons, compared with 393,767 tons in April.

—T—T—

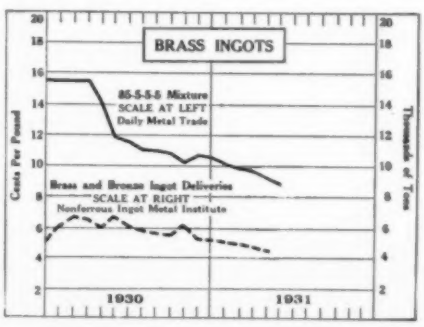
In the Birmingham district, pressure pipe manufacturers report brighter prospects. Present operations are estimated at 50 per cent of capacity.

—T—T—

Orders for steel castings in April totaled 45,671 tons, according to the department of commerce. This is a decline of 2488 tons over the March total. However, railway specialties were in greater demand during the month.

—T—T—

Average New York prices of nonferrous metals during May, according to *Daily Metal Trade*, were as follows: Casting copper, 8.780c; electrolytic copper, 8.897c; Straits tin, 23.212c; lead, 3.818c; antimony, 6.531c; aluminum, 98-99, 22.900c. Zinc averaged 3.304c, East St. Louis, Ill.



What the Foundries Are Doing

Reflecting the Activities of Gray Iron, Malleable, Steel and Brass Shops

Progressive Foundry, Perry, Iowa, has discontinued business.

Baldwin Brass Foundry, Cedar Rapids, Iowa, has discontinued business.

United Boiler, Heating & Foundry Co., 200 Wilcox street, Hammond, Ind., has increased its forces.

Orange Car & Steel Co., Orange, Tex., operates a foundry for the production of gray iron castings.

Great Lakes Brass Works, Bay City, Mich., is a maker of brass castings and operates a machine shops.

Rubenstein Bros., 71 Craig street, west, Montreal, Que., manufactures brass and aluminum castings.

Tappan Stove Co., 150 Wayne street, Mansfield, O., is reported operating at approximately 70 per cent of capacity.

Lycoming Mfg. Corp., Oliver street and N.C.R.R., Williamsport, Pa., is operating on a six day a week schedule.

Buckeye Foundry Co., Cincinnati, has moved into its new plant at 2800 Beekman street, Cincinnati.

The plant of the Luther Mfg. Co., Olean, N. Y., recently was damaged by fire. Principal loss was in patterns.

Aurora Metal Co., Aurora, Ill., is a manufacturer of die castings. The company also maintains a laboratory and die shop.

Modern Aluminum Foundry, 5909 Regent street, Huntington Park, Calif., is a manufacturer of aluminum castings.

Fewlass-Leen Brass & Iron Co., 215 Pike street, Cincinnati, manufactures brass and aluminum castings and maintains a machine shop.

Canadian Die Castings Ltd., Owen Sound, Ont., has taken over the Aluminum Steel Products Ltd., manufacturers of die castings.

Hastings & Schoen Co., 262 Liberty street, Springfield, Mass., operates a brass and aluminum foundry and maintains a pattern shop.

Wedlake Aluminum Co., 1616 Willow street, Hoboken, N. J., manufacturers brass and aluminum castings. (Noted May 1.)

Oil City Brass Works, 326 Neches street, Beaumont, Tex., makes brass and aluminum castings and operates machine and pattern shops.

Geo. Staats & Co., 74 Bayard street, Brooklyn, N. Y., manufactures brass and aluminum castings and operates a machine shop.

Smith Bros. Foundry Ltd., 632 Pembroke street, Victoria, B. C., manufactures brass and aluminum castings and operates a machine shop.

Globe Brass Foundry & Pattern Corp., Brooklyn, N. Y., has been incorporated with $10,000 capital by P. M. Jeffrey, Jamaica, N. Y.

Sterling Products Corp., 2914 North Market street, St. Louis, manufactures low pressure aluminum die castings and operates a machine shop.

Cogswell Mfg. Co., 140 Norman street, West Springfield, Mass., operates a brass and aluminum foundry and machine and pattern shops.

Rex Foundry Co., 3562 East Palmer avenue, Detroit, has been incorporated with $5000 capital by H. A. Petrequin, 10967 Chelsea avenue, to manufacture metal products.

North Shore Foundry Co., 549 West Randolph street, Chicago, now is manufacturing gray iron castings. The company also maintains a pattern shop.

Aetna Machine Works, 2036-44 Dommick street, Chicago, formerly Lewis J. Brainard & Sons and prior to that change, the American Die Casting Co., is a maker of die castings. The company also maintains a machine shop.

Carran Foundry & Smelting Works, Ludlow, Ky., capitalized at $100,000 has been granted a state charter. Incorporators were F. W. Schwenck, T. E. Darlington, M. C. Carran, Sam S. Carran and Jack P. Carran.

Union Iron Works, 1243 Twenty-fourth street, northwest, Washington, operates a foundry, machine shop and pattern shop. The company manufactures gray iron and aluminum castings. (Noted May 15.)

Industrial Research Laboratories, 1740 Standard avenue, Glendale, Calif., has taken over the plant formerly operated by the G. & F. Metal Products CoC., manufacturer of brass and aluminum castings.

Lauder & Co., 186 Adelaide street, Toronto, Ont., operates a foundry for the manufacture of brass and aluminum castings. The company also maintains a machine shop and a pattern shop.

Coos Bay Iron Works, Marshfield, Oreg., whose foundry recently was damaged by fire, will rebuild completely and will install a small steel foundry in place of the former cupola. J. S. Lyons is vice president and manager of the company. (Noted May 15.)

American Iron & Bronze Works, Oakland, Calif., is establishing operations at 1080 Fifth street, with 4000 square feet of floor space. Paul Romack and R. W. Weeks are interested in the company. Products will include ornamental iron and bronze work.

Quality Alloy Casting Co., Easton, Pa., recently was sold and has changed its name to the Custom Casting Co. The company specializes in aluminum, brass and bronze castings. George M. Douthett is president. (Noted June 1.)

Chrom Alloys Mfg. Co., Oakland, Calif., is the successor to the Cardinal Metals Mfg. Co. The company is the sole maker of a nickel, chromium, bronze alloy known under the trade name, krom-alloy. The company also makes brass and aluminum castings. (Noted Jan. 1.)

Malleable Iron Range Co., Beaver Dam, Wis., May 6 completed 365 days without a lost-time accident, the company's general safety committee has announced. This record safety year included 855,200 work hours. The best previous record was 237 days with 639,800 hours, in 1928.

Springdale Foundry Co., Springdale, Pa, proposes to install a 10-ton capacity overhead crane in the one story foundry, 50 x 130 feet, to be erected in Springdale. George Chismark, Seventh and Mill streets, Tarentum, Pa., is secretary and treasurer. (Noted April 1.)

Baldwin Locomotive works, Philadelphia, has purchased the subsidiary companies of Cramp Morris Industrials Inc. Those include I. P. Morris & De La Vergne Inc., Cramp Brass & Iron Foundries Co., De La Vergne Engine Co., all of Philadelphia; Federal Steel Foundry Co., Chester, Pa.; and the Pelton Water Wheel Co., San Francisco.

Edison General Electric Appliance Co. Inc., Waynesboro, Va., a subsidiary of the General Electric Co., Schenectady, N. Y., has taken over the W. J. Loth Stove Co. Inc., Waynesboro. The company maintains a foundry for the production of gray iron and brass castings, a machine shop, a pattern shop and a laboratory.

Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., is undertaking a plant expansion which will increase its capacity from 50,000 to 75,000 tons annually. The new unit will be 68 x 512 feet. Austin Co., Cleveland, has been awarded the contract for the kiln building which will cost over $500,000. David O. Thomas is general manager of the Saginaw plant.

Trade Publications

LIGHTING CABLE—A recent folder from the Sullivan Machinery Co., 30 Church street, New York, describes a safety lighting cable for extension lighting uses. The new cable assembled to exacting electrical standards is recommended to replace makeshift lighting extensions.

MOTORS—Synchronous motors designed for driving low-speed, constant-speed machinery where low starting current with high torque is required are discussed in a leaflet recently issued by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Operation, construction, and applications are considered.

CONTROL—Catalog No. 8008 recently issued by the Brown Instrument Co., Wayne and Roberts avenues, Philadelphia, illustrates and describes automatic control instruments for temperature, pressure, flow, and similar uses. Illustration of these instruments in typical industrial applications is followed by description of individual instruments with operating characteristics.

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ABRASIVE WHEELS

Safety Grinding Wheel & Machine Co., Springfield, O.
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American Steel Abrasives Co., Galion, O.
Globe Steel Abrasive Co., Dept. F., Mansfield, O.
Philadelphia Steel Abrasive Co., The, Frankford, Philadelphia, Pa.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.
Steelblast Abrasives Co., Cleveland, O.

ACETYLENE DISSOLVED or in Cylinders

Linde Air Products Co., 30 E. 42nd St., New York City.
Prest-O-Lite Co., Inc., 30 E. 42nd St., New York City.

ACETYLENE GENERATING APPARATUS

Linde Air Products Co., 30 E. 42nd St., New York City.
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

AIR COMPRESSORS

General Electric Co., Schenectady, N. Y.

AIR CONDITIONING Equipment

Drying Systems, Inc., 1801 Foster Ave., Chicago, Ill.

AIR SEPARATORS—See Separators—Air, Moisture, Oil

AIR TOOLS—See Tools—Pneumatic

ALLOYS

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

ALUMINUM

British Aluminium Co., 122 E. 42nd St., New York City.

ALUMINUM—Alloys and Ingots

British Aluminium Co., 122 E. 42nd St., New York City.

ANNEALING OVENS—See Ovens—Annealing

ARCHITECTS—Industrial

Austin Co., The, 16112 Euclid Ave., Cleveland, O.

ARC WELDING EQUIPMENT

General Electric Co., Schenectady, N. Y.

ARRESTORS & COLLECTORS—Dust—See Dust Arresting and Collecting Systems

BABBITT METAL

Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.

BAND SAWS—See Saws—Metal Band

BARROWS—Foundry

Sterling Wheelbarrow Co., Milwaukee, Wis.

BARS—Iron and Steel

Bethlehem Steel Co., Bethlehem, Pa.

BELLOWS—Molders

Osborn Mfg. Co., Inc., 5401 Hamilton Ave., Cleveland, O.

BINDERS—See Core Binders

BLAST METERS

Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.

BLOWERS

General Electric Co., Schenectady, N. Y.
Knickerbocker Co., The, Jackson, Mich.

BOLTS AND NUTS

Bethlehem Steel Co., Bethlehem, Pa.

BOND—Molding Sand

Great Lakes Foundry Sand Co., Penobscot Bldg., Detroit, Mich.

BOOKS—Technical

Penton Publishing Co., Cleveland.

BOTTOM PLATES—Steel

Shanafelt Mfg. Co., Canton, O.
Truscon Steel Co. (Pressed Steel Div.), 6114 Truscon Ave., Cleveland, O.

BOXES (Tote)

Sterling Wheelbarrow Co., Milwaukee, Wis.

BRONZE—Manganese

Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.

BRUSHES

Osborn Mfg. Co., Inc., 5401 Hamilton Ave., Cleveland, O.

BRUSHES—Motor and Generator

General Electric Co., Schenectady, N. Y.
United States Graphite Co., Saginaw, Mich.

BRUSHES—Wire

Osborn Mfg. Co., Inc., 5401 Hamilton Ave., Cleveland, O.

BUCKET CARRIERS—Pivoted

Milwaukee Electric Crane & Hoist Corp., Milwaukee, Wis.

BUCKET LOADERS FOR Sand Mills

National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.

BUCKETS

Penn Foundry & Mfg. Co., Reading, Pa.

BUCKETS—Clamshell, Dragline, Grab

Brosius, Edgar E., 19th St. & P. R. R., Sharpsburg P. O., Pittsburgh, Pa.
Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.

BUCKETS—Electric

Erie Steel Construction Co., Erie, Pa.

BUCKETS—Line

Milwaukee Electric Crane & Hoist Corp., Milwaukee, Wis.

BUILDINGS—Foundry, Factory, Industrial

Austin Co., The, 16112 Euclid Ave., Cleveland, O.

BURNERS—Acetylene—See Torches and Burners—Acetylene, Blow, Oxy-Acetylene

BURNERS—Oil or Gas

Foundry Equipment Co., The, 1831 Columbus Rd., Cleveland, O.
Hauck Manufacturing Co., 126 Tenth St., Brooklyn, N. Y.

BUSHINGS—Flask Pins

Michigan Screw Co., Lansing, Mich.

CALCIUM—SILICON

Electro Metallurgical Sales Co., 30 E. 42nd St., New York City.

CALCIUM CARBIDE

Linde Air Products Co., 30 E. 42nd St., New York City.

CALKING HAMMERS—Pneumatic

Independent Pneumatic Tool Co., 600 W. Jefferson Blvd., Chicago.

CARBIC

Linde Air Products Co., 30 E. 42nd St., New York City.

CARBIDE

Linde Air Products Co., 30 E. 42nd St., New York City.

CARS—Annealing, Billet Furnace Charging, Core Oven, Pig iron

Foundry Equipment Co., The, 1831 Columbus Rd., Cleveland, O.

CARS—Platform, Industrial Railway, Transfer, Narrow Gage

Bethlehem Steel Co., Bethlehem, Pa.
Foundry Equipment Co., The, 1831 Columbus Rd., Cleveland, O.
Penn Foundry & Mfg. Co., Reading, Pa.

CARS—Sandblast

Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.

CARS & Locomotives—Industrial

Industrial Equipment Co., The, Minster, O.

CASTINGS—Gray Iron

Bethlehem Steel Co., Bethlehem, Pa.

CEMENT—Furnace

Alpha-Lux Co., Inc., 192 Front St., New York, N. Y.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

CEMENT—High Temperature Refractory

Alpha-Lux Co., Inc., 192 Front St., New York, N. Y.

CEMENT—Metallic

Shanafelt Mfg. Co., Canton, O.

CHAPLETS

Shanafelt Mfg. Co., Canton, O.
Standard Chaplet & Supply Co., Swetland Bldg., Cleveland, O.

CHARGING EQUIPMENT—Air Furnace

Euclid Crane & Hoist Co., The, 1364 Chardon Rd., Euclid, Ohio.

CHIPPERS—Pneumatic—See Hammers—Chipping and Riveting, Pneumatic

CHISEL—BLANKS—Pneumatic

Independent Pneumatic Tool Co., 600 W. Jefferson Blvd., Chicago.